PROCEEDINGS OF THE DIVISIONAL SEMINARS OF CMFRI, COCHIN

(JANUARY 2001 – JULY 2003)

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COMPILED BY

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COCHIN

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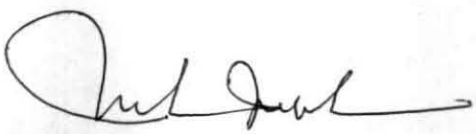
PREFACE

The divisional seminar programme was initiated at the Central Marine Fisheries Research Institute, Cochin during November 2000 to discuss the topics of current interest in marine fisheries research with a view that the seminars and the ensuing discussions should enable to improve the existing research methodologies/technologies, identify researchable issues for the PGPM and formulate new research projects. Shri G.S. Daniel Selvaraj, Principal Scientist was identified to organize the Divisional level seminars at the Headquarters and over forty seminars have been conducted representing all Divisions.

This volume containing the proceedings of thirty two seminars (upto July 2003) has been set for keeping in the Library of CMFRI, Cochin for future reference.



(Mohan Joseph Modayil)

Director

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SEMINAR BY DR. P.KALADHARAN, SCIENTIST SR.SCALE, FEM DIVISION
C . M. F. R. I., COCHIN

TOPIC: ***HUMIC ACIDS AND THEIR EFFECT ON MERCURY TOXICITY TO MARINE ALGAE***
02-02-2001. 15.00- 16.30 HRS, ROOM NO.301

PRESENTATION

Humic acids are organic decomposition products that impart yellowish brown colour to the coastal waters. They exist in particulate and dissolved state.. Plankton decomposition matrerials termed as "gelbstoff" by Kale (1966) and water humus by Stephenkot and Skopintew(1955) are similar to humic acids. Humic acids are regarded as promoter of phytoplankton growth and as natural chelaters of metal ions. An attempt was made to study quantitatively the distribution of humic acids in the estuarine and inshore waters of Cochin and their effect on mercury toxicity to marine algae. The seminar threw light on the method of extraction and quantification of humic acids from water as well as from sediment. Humic acid levels in water ranged from 0.294 – 5.881µg/l and 0.485 to 2.45 µg/g in sediment. Humic acids extracted from inshore areas of Cochin did inhibited the mercury toxicity significantly to the cultures of microalga *Isochrysis galbana* and a seaweed, *Ulva lactuca*. The presentation was well documented and supported by projecting relevant Tables and Graphs.

DISCUSSION

Dr. C.P.Gopinathan wanted to know about the availability of mercury in backwaters.

Dr.P.Kaladharan replied that studies conduced by CMFRI and the NIO revealed mercury levels fluctuating with seasonal changes, but the levels were well within the tolerance limits.

Shri P.Vijayagopal asked about the chemical composition of humic acids.

Dr.P.Kaladharan replied that THA are more related to Fulvic acid, fumaric acid etc, with free active sites for binding.

Dr.Reeta Jayashankar asked (i) whether the ongoing project on Marine Pollution had attempted to correlate the humic acid content with phytoplankton bloom or seaweed growth in natural environment? And

(ii) Whether humic acids can be substituted as an organic fertilizer for mass culture of phytoplankton?

Dr.P.Kaladharan replied to the former that no attempt on such correlation was takenup other than this maiden one from Cochin. While replying to the latter, humic acids can be supplemented as organic fertilizer or growth promoter to mass culture of phytoplankton.

Dr.Reeta Jayashankar also opined that the present study needed more case studies with many species of phytoplankton.

Dr.P.Sathyadas asked whether quantification has been madefor humic acid content in mud bank sediment, and the answer was negative

Dr.L.Krishnan wanted to know whether THA can be extracted and produced as a powder for R & D applications and the reply was positive from Dr.Kaladharan.

One of the M.F.Sc. students Mr. Anand wanted to know the method of extraction and quantification of THA from sediment and water samples.

Dr. Kaladharan explained indetail the method and reference related to his interest.

The seminar came to an end by 16.20 hrs and Shri. G.S.D. Selvaraj thanked Dr.P.Kaladahran for the presentation and also thanked everybody who attended the seminar and for their deliberations.

SOME OF THE RESEARCHABLE ISSUES

- Correlation between river run-off (import of humic acids) and bloom formation- quantity of THA and quality of blooming algae.
- THA as growth promoter and fertilizer for mass culture of phytoplankton-Lab-lab culture in fish ponds.
- Mechanism and feasibility studies on humic acid induced abatement of coastal pollution.

Dr. Reeta Jaya Sankar
Rapporteur.

Seminar on "Macronutrient Interaction in Shrimps" by Shri. P. Vijayagopal, Scientist, PNP Division. 02-03-2001, 15.00-16.30 hrs, Room No.301

The speaker discussed the subject, giving emphasis to the work conducted by him in *Penaeus indicus* at CMFRI.

Summary

Preliminary work done at CMFRI in *Penaeus indicus* (0.5 g) with varying levels of protein and energy using natural feed ingredients showed that a diet containing 32% protein and 451 kcal/100g GE performed at par with a diet containing 47% protein and 429 kcal/100g GE. Protein sparing to the tune of 15% could be achieved with an increase in 30% non-protein constituents in the feed. By regressing final biomass with protein and GE in the feed and by fitting second degree polynomials an optimum protein level of 31.14% and GE level of 430 kcal/100g could be arrived at.

Further, systematic studies in the same species, in three size groups, using semi-purified diets showed that in animals of <1 g size 45% protein and 420 kcal/100g energy indicated the best response, however, a level/levels above this has to be tested in this size group to draw definite conclusions.

In size range of >1g but <5g a lower protein requirement at 40% proved optimum with an energy level of 400 kcal/100g. In the size range of >5g but <10g a further lowering of protein level to 35% with 380 kcal/100g appeared optimum. This level also has to be delineated to know whether an optimum level below this exists or not.

Similarly, lipid levels of 6, 9 and 12% were also tested in the same size groups of shrimps. A pattern similar to that found with protein and energy mainly from carbohydrates was found. That is, in animals of < 1 g size 12% lipids and 45% protein indicated the best growth and other nutritional parameters tested. In the size range of >1 g but ≤ 5 g 9% lipids and 40% protein was found to be the optimum. In the animals of the size range > 5g but ≤ 10g, a further lowering of nutrient density to 6% lipids and 35% protein was observed. However, as in the case of first three experiments the delineation of levels above 45% protein and 12% lipids and levels below 35% protein and 6% lipids is required.

Another experiment on *Penaeus semisulcatus* (8-9 g) was conducted with protein levels of 35% and 40% and (digestible energy) DE values of 280, 300 and 320 kcal/100g. At both the levels, in a 30 day nutritional trial, similar growth at 35:320 and 40:280 protein: DE respectively, indicated a protein sparing of 5% with an increment of 40 kcal/100g DE.

The presentation was exhaustive supported by all tables and graphs.

Discussion

Dr. R. Paul Raj : suggested that 25% protein level should have been included while conducting experiments restricting to lesser number of energy levels. A feeding schedule of 3 times per day would have been better instead of once daily because feeding efficiency depend on feeding schedule.

Dr (Mrs) Mary K. Manissery: Whether mortality was a serious problem while conducting the experiments? If so whether it is due to the protein levels?

Shri.P.Vijayagopal: At very high energy levels, faced problem of mortality. However the mortalities were recorded and feeding rate adjusted accordingly.

Dr.Sampson Manickam: What about the stability of the feed

Shri.P.Vijayagopal: The feed gets consumed within 2 – 3 hours.

Dr. Sampson Manickam: Any explanation for variation in performance in laboratory conditions and on farm conditions.

Shri.P.Vijayagopal: On farm research is a heavily debated area & very expensive.

Dr. E.V. Radhakrishnan: Any harmful effect due to energy required for digestion of protein at higher levels?

Shri.P.Vijayagopal: Energy for digestion (specific dynamic action) changes only with body size, not with level of nutrients

Shri. T.S. Velayudhan: Any relation with maturation stage?

Shri. P.Vijayagopal: Beyond the scope of the seminar. It is a vast topic

Dr. E.V. Radhakrishnan: What was the ideal ratio of protein and non-protein energy?

Shri. P. Vijayagopal : 57% of NP energy gave maximum growth. 15% reduction in protein is possible. Protein sparing action could be clearly demonstrated.

Dr (Mrs) Reeta Jayasankar: Any relation between quality of meat and protein?

Shri. P. Vijayagopal: This aspect was not investigated.

Dr. Sampson Manickam: Any effect due to size variations?

Shri. P. Vijayagopal : Statistical methods are available to test the results when there are initial size variations.

Dr. E.V. Radhakrishnan: Source of seed for the experiments?

Shri. P. Vijayagopal Hatchery produced seeds.

Dr. G.S. Daniel Selvaraj: Any effect of stress on mortality?

Shri. P. Vijayagopal: Lot of variables in the aquatic medium. There are possibilities of human errors under controlled conditions – But all these variables are kept at the minimum possible level.

Dr. L. Krishnan: Any effect due to temperature variations?

Shri. P. Vijayagopal : Though the atmospheric temperature fluctuates, water temperature does not vary much.

Kochi,
03-03-2001

(K.S. Sobhana)
Scientist, Rapporteur
PNP Division

Seminar on "Effect of Aflatoxin on Fishes"
Presented by Dr. K. C. George, Sr. Scientist, PNP Division.
23-03-2001, 15.00-16.30 hrs, Room No.301

The Speaker presented the seminar based on his experience in the research work conducted on Aflatoxicosis in fish for his PhD thesis and also on mycotoxicosis in shrimps under the ongoing NAT Project.

Summary

Aflatoxins are the toxins produced by *Aspergillus flavus*, *A. parasiticus* and other fungi growing on grains, oil seeds, oil cakes etc., under hot humid conditions and poor crop management. Oil cakes and grains are used in feed formulation of fish and shrimps. Hence, aflatoxin contamination of feed is a usual problem. Aflatoxins are classified into Aflatoxin B_1, Aflatoxin B_2, Aflatoxin G_1 and Aflatoxin G_2 based on their Rf values in chromatogram and type of fluorescence under U.V. light. Aflatoxin M_1 and Aflatoxin M_2 are metabolites excreted from aflatoxin consumed animals, which are also toxic. Aflatoxins are hepatotoxic and carcinogenic. In trout it is responsible for outbreaks of hepatocarcinomas. In tilapia it produces multiple neoplasms. High levels of toxin causes liver damage, haemorrhages and death. Low levels lead to cumulative toxicity and carcinogenicity. Recent studies revealed that the toxin is an immunosuppressant in fishes. Though studies in crustaceans are limited, aflatoxins severely affect prawns, lobsters and crabs. In prawns the red disease has been attributed to aflatoxin contamination of feed.

Discussions

Dr. G.S. Daniel Selvaraj: If the toxin is not destroyed by cooking, what are the amelioration measures?

Dr. K.C. George :

1. Very high temperature around 300°C can destroy the toxin, but it will definitely affect the nutritive value of the feed.
2. Sodium Aluminium silicate can adsorb toxin to some extent.
3. *Lactobacillus* fermentation, use of turmeric, spices, certain herbal preparations etc are reported to be useful.

Dr. D. Noble: The fungal infection takes place during pre-harvest or post-harvest?

Dr. K.C. George : About 80% of the infection takes place during pre-harvest when there is drought and water content comes down, the plant will be under stress and get infected by the fungus. But toxin production may be more during post-harvest during storage.

Dr. R. Paul Raj : What is the significance of M_1 and M_2 ?

Dr. K.C. George : M_1 and M_2 are metabolic products of Aflatoxin and these are also toxic (carcinogenic). These can be transferred through milk and meat.

Shri. P. Vijayagopal: What are the methods of estimation of the toxin?

Dr. K.C. George :
1. Solvent extraction (TLC) – Thin layer Chromatography.
2. Monoclonal antibody based affinity Chromatography
3. HPLC (most sensitive)

Mr. Govindaraju: If the water activity of the ingredients can be reduced, whether the toxin production can be reduced?

Dr. K.C. George : If moisture content (during storage) is high, it favours bacterial growth and the fungus produces the toxin in order to inhibit bacterial growth.

Concluding remarks

In addition to Aflatoxins there are other mycotixins like Ochrotoxin,, Fusarium toxin etc. which need to be studied. Constant monitoring of feeds and ingredients for the presence of the toxins is very much essential.

Kochi,
24-03-2001.

(K.S. Sobhana)
Scientist. (Rapporteur)
PNP Division

Seminar on "Simulation modelling in marine fisheries"
Presented by Dr. M. Srinath, Head, F.R.A. Divison

The seminar was held on 20-04-2001 at 3:15pm in Room No.301. Dr. M.Srinath started the seminar by introducing the concept of Systems Analysis of which simulation modelling forms a part. He explained fisheries as a system consisting of harvesting, post harvesting, socio-economic condition etc. He then described the different phases of systems analysis namely conceptual model formation, quantitative specification, validation and use of the model. In the first phase the components of the system are categorized, their relationships are identified and the conceptual model is represented through a diagram. In the second phase the dynamics of each system are represented using mathematical models such as Beverton and Holts model, Scheafer's models etc. used in fisheries. The functional form of the relationship and estimation of parameters are carried out in this phase. In the third phase the sensitivity of the model to changes in the parameters are examined and closeness of the system predicted by the model to the actual is also examined. In the final phase these models are used to obtain management reference points such as MSY, MEY, optimum fleet size etc. and also to simulate system behavior.

He then defined simulation as the process of using a model to mimic step by step behaviour of the system and then gave the historical background of simulation modelling. He mentioned that in fisheries, simulation modelling was first used in 1965 for the prediction of Atlantic croakers. In India it was first used in 1991 at Visakapatanam in the Bio-economic modelling to study the fishery in the northeast region. In this a simplified conceptual model for fishery was used which can be size specific or age specific. The inputs for this model were recruitment details, growth, fishing effort, length at capture, length frequency data, length-weight relationship, natural and fishing mortality and landings. The factors studied were the effect of change in effort, inter and intra sectoral changes and the effect of closing the fishery.

Finally he explained about "Beam-4" and "Ecopath" models. The objective of Beam4 is to predict yield and evaluate economic performance. Basic models like Schaefer model were used in this and the factors like closing of certain fleets in the fishery in northeast region were studied by simulating certain management options. Based on this, recommendation on some category of fishing fleets were made for the northeast region. With this he concluded and the seminar was open for discussion.

In the discussion Dr.Radhakrishnan, Head, CFD asked about the relevance of the concept of stock in tropical waters. The speaker's suggestion was that for practical reasons the concept of unit stock can be considered for all demersal resources. Dr. Jayasankar, Scientist (Sr.scale), PNPD asked whether there is any suitable model for studying the fishery of non-targeted groups. For this the suggestion was to study the inter-relationship between targeted and non-targeted groups. Dr. N.G.K. Pillai, Head, PFD suggested to take up systems analysis to study the effect of ban on trawling as there are no clear cut study carried out on this aspect though there is ban on trawling since 1988. The speaker proposed to initiate an inter-divisional project on this aspect. Dr. Ramachandran, Scientist, SEETED asked about the robustness of data and in efficiency

of the simple models used in system analysis. The answer given by the speaker was that models used can be suitably modified or new models can be attempted for better results and quality of data is a very essential item for any kind of study. Shri.K.N. Kurup, Senior Scientist, FRAD gave his views about data and model requirements for such a study.

Cochin,
25-4-01

Sathianandan. T.V.
Scientist (Sr. Scale)
Rapporteur for the Semina

SEMINAR BY SMT GANGA .U; PFD CMFRI, COCHIN

TOPIC: SEASONAL GROWTH OSCILLATION IN INDIAN OIL SARDINE *SARDINELLA LONGICEPS* ALONG THE EAST COAST
18-05-2001, 1500-1630 HRS, ROOM NO. 301

PRESENTATION

The fluctuations in abundance of pelagic resources like the oil sardine have been a subject matter of intensive research by many scientific workers from very early times to the present period. However, a satisfactory answer to this phenomenon is still evading. Some of the recent trend in the oil sardine fishery is the increased landings of this resource along the east coast during the nineties. Here also many reasons like rise in sea level, migration of sardine from west to east coast or existence of a separate stock have been cited without any solid scientific basis. With production indicating an upward trend it is all the more essential to attempt assessment of stock for rational exploitation and conservation. In this connection it is essential to study the various population parameters, the important among them being the growth. The seminar, therefore, is intended to present the growth pattern in oil sardine along the east coast in comparison with the west coast. The study is based on two years data from the boat seine catches at Visakhapatnam. Attempt has been made to relate the growth in this species with environmental data as well. The study is well documented and supported by a series of graphs on various aspects of growth, trend in production and various environmental factors.

DISCUSSION

Shri Daniel Selvaraj: Since there is no clear cut seasons as in temperate waters , how temperature can be the factor that influences the growth in sardines?

Smt Ganga: The monsoon and the upwelling are the factors that influence the growth.

Dr.K.J.Mathew: Whether the oil sardine found along the east and west coasts belong to the same stock or to different stocks?

Smt Ganga: So far no studies have been carried out to differentiate the stocks along east and west coasts

Dr.C.P.Gopinathan: There was a news paper coverage recently about occurrence of oil sardine in the Ashtamudi Lake at Quilon.

Smt Ganga: Yes we are aware of it. The species indicated stunted growth

Dr.M.Srinath: Oil Sardines that occur along the east and west are localized stocks. When the population in an area is a mixture of different stocks we cannot apply the growth models. Further he pointed out that the K value would differ depending on the starting size group in Elefan programme. So while comparing east and west coast

growth pattern there should be uniformity in the selection of starting size. He also pointed out that most of our sampling for various studies are based on the exploited phase of a resource which again depends on the type of gear and their selectivity. Hence all the size groups are not represented in the sample.

Shri Selvaraj: Wanted to know whether there exists any inter annual variations in growth. Every year there is good production of phytoplankton. Further, we don't have any data on the larvae and young fishes. Whether any attempt has been made to correlate the fluctuations in abundance of oil sardine with the rainfall data

Dr.N.G.K.Pillai: How can we say without any data there is good production of phytoplankton during every year?

Smt Ganga: Time series data are required to study the inter annual variations in growth.

Dr.Srinath: Correlation of sardine catch and rainfall some times may not show any direct relation. However, the rain fall during the IV quarter has been found toinfluence the sardine catch. Further he stated that we have rainfall data from 1961 onwards. Most likely the onset of monsoon has a profound influence on the sardine abundance.

Dr.Kaladharan: Wanted to know whether the study is based on data collected from the entire east coast?

Smt Ganga: The study is based on the data collected from Visakhapatnam

Dr.Jayasankar: He referred to the study of Longhurst and Wooster and wanted to know whether their studies pertains to oil sardine along he west coast?

Dr.Srinath: Pointed out that the study area is the west coast of India. They have correlated the sardine fishery with mean sea level.

Shri Velayudhan: Wanted to know whether we are studying the various biological aspects of the specie occurring along the east coast?

Smt Ganga: Presently we have studied the growth characteristics only.

The seminar came to a close by 1615 hrs and Shri G.S.D.Selvaraj thanked Smt Ganga for the nice presentation of the topic. He also thanked every body for attending the seminar and for their interactions.

SOME OF THE RESEARCHABLE ISSUES

- Need for offering scientific explanation for the increase in abundance of oil sardine along the east coast.

- Need for unit stock studies to differentiate the stocks of oil sardine along east and west coast of India.
- Need for tagging of oil sardine along the east and west coast to find out probable migration
- Studies on the fluctuations in abundance in relation to environmental factors
- Studies on various biological aspects of oil sardine from along the east coast of India
- Studies on stock assessment of the species from the east coast.
- Effect of introduction of ringseines along the S.E coast on the resource.

Kochi
19.05.2001

(Dr.A.A.Jayaprakash)
Senior Scientist

Report on Seminar

Topic: Recent Innovations in Edible Bivalve Farming
By: Dr. V. Kripa, Senior Scientist, MFD, CMFRI, Cochin
Date: 01-06-2001, 1500 h

The above seminar was attended by 61 participants. Dr. Kripa outlined the various new techniques developed for reducing cost of inputs and labour in mussel and edible oyster farming. Methods by which bivalve farming can be integrated with estuarine fish farming were also explained. The economic analysis also showed considerable improvement in the returns to the farmer.
During the discussion, Dr. N.G.K.Pillai asked about how water quality of growing areas can be ascertained and also whether growth in natural beds and farm were compared. Dr. D.Noble suggested that there are methods by which copper compounds are coated on to bamboo poles to extend their life in brackish water. Dr. Kripa replied that copper compounds can leach into medium and bivalves can accumulate them with detrimental effect. Dr. P.C.Thomas enquired whether the *Etroplus* in fish cages were fed. Dr. Kripa replied that they were fed with artificial feed pellets at 10% body weight. Mr. J.Narayanswamy wanted to know how many bivalve farmers were there in Kerala and whether an agency like ADAK can offer financial assistance. Dr. K.K. Appukuttan replied that ADAK is an agency strictly for promoting shrimp culture, however, other agencies like BFFDA have come forward to give financial assistance to bivalve farmers. Ms. Sheela Immanuel wanted to know about the involvement of middlemen in bivalve marketing and Dr. P. Jayasankar discussed about the lack of demand for bivalve products.
The seminar came to a close at 1600 h after tea and snacks and participants had the benefit a viewing a photo exhibition on bivalve farming.

(K.S. Mohamed)
Rapporteur

Report on Seminar.

Dr.Sivakami presented the seminar on **The Researchable issues towards further development of demersal fish production in India** on 15.6.2001. Dr.Sivakami stated the present status of demersal finfishes with catch trends and other relevant information. Then highlighted issues like Taxonomic studies of groupers and sciaenids; fecundity concept, resource depletion, multispecies stock concept, coastal aquaculture and need for extension and education in Marine Fisheries.

During the discussion, Dr, Jayasankar pointed out the need for incorporating the catch rate of each resource for detailed studies. Dr. Sunil Kumar Mohammed wanted to know the criteria for considering the flat heads as endangered. . Dr. Sivakami explained that the catch and the size of the fish showing decline.

Narayanaswami informed that the artificial reefs at Calicut causing damage to trawl nets. . Dr. Sivakami informed that while selecting the site of artificial reefs area care must be taken.

T.S.Velayudhan wanted to know about the trawl ban and improvement of the marine fish catch. Dr. Sivakami answered that it is always better to keep the bottom undisturbed during the monsoon season, as the breeding season of the many of the marine fishes during that time. Dr. J.P.George discussed the issues regarding Pelagic trawling, the by catch of *Ostoegenus* and depletion of Lizardfish. Dr .D. Noble asked about the future candidate species for culture experiments. Dr. Sivakami informed that *Silllago sihama*, Rabbit fish, *Lates calcarifer* and groupers are the future candidate species.

At the end, the Director, Dr (Prof) Mohan Joseph Modayil advised that the seminars should be a place for discussing various issues and identifying topics for advanced research as a brainstorming session. The Seminar should focus the issues more carefully and analytically and to find out answers to the issues. The Institute have 50 years of marine fisheries data and we should find conclusions and disseminate the information to the end users.

28-6-2001

Dr. K.K. Joshi,
RAPPORTEUR

Seminar by Dr. C.Ramachandran, SEETTD,CMFRI,Cochin.

Topic : P/RRA Techniques in Fisheries Extension Research
29 June 2001, 15.15- 16.30
Room no.301

Presentation

The seminar focussed on the need for PRA and RRA in fisheries. Before explaining the importance of these approaches in the fisheries sector the wider context which necessitated the evolution of this techniques was elaborated by means of the concept of paradigm shifts in research as well as extension. The PRA/RRA technique is a via media between data collection approaches of survey and anthropological methods. He also briefed about the various techniques coming under the PRA. With the example of the IVLP, Elannkunnapuzha village the details and the results of PRA conducted was highlighted. A few tools tried in the fisheries sector were also explained. The need for developing a model responsible fisheries village involving a multidisciplinary team of scientists from the Institute was posed as a possible platform for the application of these techniques in the future.

Discussion

Shri. Daniel Selvaraj : Role of other divisions in developing a model village

Dr. C. Ramachandran : Multidisciplinary approach is the need of the hour in marine fisheries. Our rich knowledge base needs to be revalidated visa vis that of the stakeholders.

Dr. Sunil Kumar : In the present circumstances and with the open access nature of marine fisheries the concept of responsible fisheries cannot be confined to a single village.

Dr. C. Ramachandran : Can we learn from the experience of Munambam as initiated by Green Seas regarding the ban of night trawling?.

Dr. Sunil Kumar : There is no scientific basis for ban on night trawling.

Shri. Balachandran : 1. CMFRI s recommendations are meant for formulation of policies at national level
2. More enforcement of regulations are needed rather than technological interventions.
3. Education to the fisherfolk is the only solution which we cannot undertake.
4. Whether all the problems identified through PRA can be solved.

Dr. C. Ramachandran : - The way in which the problems were identified and the interventions planned in under IVLP shows that PRA can be effectively used.

-We need to think about launching a Marine Fisheries Conservation Extension and the "software" aspect of this in terms of definite recommendations need to be developed which can be used in Extension interventions.

Dr. Reeta Jayasankar : The technologies developed by us need to be further standardized and proved in the different locations before recommending them as an alternative employment to marine fishermen.

Researchable issues

*Development or modification of PRA tools specifically suited to marine fisheries.

*Multidisciplinary approach should be strengthened and the logic of the prevailing technology –generation process need to be re-oriented.

Conclusion

The seminar came to an end by 1630. Dr, Daniel Selvaraj thanked Dr.C.Ramachandran for the nice presentation of the topic. He also thanked everybody for their interest and interactions in the seminar.

Sheela Immanuel 2/7/2001

(Sheela Immanuel)

Scientist, SEETD

Rapporteur.

COCHIN.

2/July/01

SEMINAR BY DR. V. CHANDRIKA, SENIOR SCIENTIST, FEMD CMFRI, COCHIN

TOPIC: MANIPULATION OF MARINE MICROBES FOR INHIBITION OF FISH PATHOGENS

20-07-2001, 1515 – 1630 hrs, Room No. 301

PRESENTATION

Shrimp aquaculture is depressed by disease caused by luminous Vibrios and viruses (Baculovirus). Chemical treatment, antibiotics and drugs increase the virulence of pathogens. Multiple Drug Resistant (MDR) forms will develop if antibiotics are used indiscriminately and there is every possibility to transfer the antibiotic resistance to human pathogens also. Solution to this problem lies only in microbial ecology and environmental microbiology by competitive exclusion principles and not in the field of pharmacology. The microbial species composition in hatchery tanks or large aquaculture ponds can be changed by microbial manipulation in order to avoid disease occurrence by probiotic technology, competitive exclusion, iron limited condition and super- red photosynthetic bacteria.

DISCUSSION

Dr. E. V. Radhakrishnan: In the Symposium on 'Aquaculture and Environment', Dr. Bright Singh had shown some bacterial suspension, it is *Nitrosomonas*?

Dr. Chandrika: No. Nitrosomonads are fastidious forms and what shown by Dr. Bright Singh might be *Bacillus subtilis*.

Dr. E. V. Radhakrishnan: Whether application of probiotics in vast culture systems is practical and feasible? Farmers always complain about the ineffectiveness of these products.

Dr. Chandrika: It is not practical to apply probiotics in vast culture systems. Farmers are to be educated about the fact. Dr. C.E. Boyd is not advising probiotics, while, dr. Moriarty is for it. I am of the opinion that, instead of going for probiotics, the farmers could reduce stocking rate to get the system remain clean by itself. Application of probiotics, to have its effect known, is time consuming and is not necessary.

M.FSc. Student: Why a system needs bacterial replenishment when resident bacterial forms are already available?

Dr. Chandrika: When the farmer goes for high stocking, it would lead to oxygen depletion and stress, which affect the immune system. In such conditions the resident stressed non-pathogenic forms get mutated to become pathogens causing disease to the stock.

M.FSc. Student: You have mentioned that probiotic bacteria could be isolated from marine sediment, then why it is not commercially produced in India?

Dr. Chandrika: It is not commercialised due to practical constraints like: lack of adequate funds and field trial constraints.

Shri. G. S. Daniel Selvaraj: Other than denitrification process, is there any other bacterial reaction in the environment in which oxygen is released?

Dr. Chandrika: There are four major nutrient cycles in the environment. Specific bacteria has specific role in the niche in these cycles. I know only about nitrogen cycle where oxygen is released.

Shri. G.S.Daniel Selvaraj: You mentioned about bacteria stimulating zooplankton production. How is that?

Dr. Chandrika: By the bacterial end products, initially phytoplankton will flourish and in turn zooplankton also. In food- web, no stage could be overlooked.

Dr. C. Ramachandran: You may explain about farmer getting educated, as you have mentioned it.

Dr. Chandrika: Farmers should be made aware of fake probiotics available in the market and how the genuine product is to be activated into logarithmic phase before application into the field and the period of application for sustainability.

SUGGESTION

Every technology has to be accepted but human error has to be taken care of.

Kochi

21-07-01

DR. IMELDA JOSEPH
Scientist
Rapporteur

Seminar by Dr. P. J. Jayashankar, PNPD, CMFRI, Kochi

Topic: DNA markers- Tools to detect genetic variations

Date: 03-08-2001; 1500- 1630hrs; Room No: 301

Presentation:

The application of molecular genetic markers to the field of fisheries was listed out to be population genetic analysis, broodstock development, fish health management, transgenesis, conservation and fish genomics. Molecular markers were explained to be consisting of polymorphic DNA and protein sequences, which could be detected from the individuals. It was pointed out that data on allelic frequency shall be a useful marker if the polymorphic information content (PIC) in a population is above 0.5. The PIC values between 0.25 and 0.5 is rated as reasonably informative where as values below 0.25 are only slightly informative.

Classifications of the different types of DNA markers were explained as below

(i) Based on the function i.e., whether coding DNA or non-coding DNA

(ii) Based on structure, i.e., single copy genes or variable number tandem repeats (VNTRs) or

(iii) Based on location i.e., cytoplasmic or nuclear.

The exons, which are the fully coding regions, constitute only less than 5% of the total genome, while the non-coding introns, which constitute about 95%, is called as junk DNA. While the single copy genes have only two alleles per locus, the VNTRs are highly polymorphic with a PIC of >0.6.The cytoplasmic DNA is constituted by mt DNA which is only 17Kb in size and its highly variable D-loop region can provide DNA markers to detect genetic variations.

The nuclear DNA in fish consists of about 0.3 to 0.4million bp and can give a large number of polymorphic patterns. The different DNA techniques involved in the study of genetic variations were narrated as extraction of DNA, restriction digestion with appropriate endonucleases, hybridization, Southern blotting, genomic library construction, sequencing and PCR technique. The commonly employed DNA markers were reported to be VNTRs, RAPDs and AFLPs.

The principle of AFLP was explained with the help of a diagram. The attempts being carried out to identify the existence of different genetic stocks of Indian mackerel and oil sardines using RAPD were also explained. The result of RAPD analysis of 30 numbers of mackerel from Mandapam, Mangalore and Kochi carried out using 35 primers as well as the AFLP analysis of 3 species of common carp were also explained.

The advantages of using RAPD and AFLP as the molecular tools were also explained namely, simplicity of RAPD and no need for prior knowledge of DNA sequence for both RAPD and AFLP. Both are useful in detecting genetic variations and mapping of useful genes.

DISCUSSION

Dr. Rajagopalan : Whether any work on reptiles for genetic stock identification is going on?

Dr. Jayasankar : No.

Dr. Rajagopalan : It will be useful to take up work on sea turtle.

Dr. Daniel Selvaraj : How many genetic groups you have identified in mackerel?

Dr. Jayasankar : The work is too little to come to a conclusion. The work I have carried out was only with 30 samples and it is not significant to come to a conclusion. We are presently carrying out the work under project No PNP/49 with more animals and more primers and shall hopefully come out with more definite conclusions.

Mr. Narayana Swamy : Can you distinguish samples from East and West ? Any attempt made using DNA markers.

Dr. Jayasankar : We are presently attempting the same.

Dr. Nandakumar : How much time is needed for it?

Dr. Jayasankar : About two years.

Dr. Sunilkumar Mohamed: Can you differentiate between plankton samples and different fish larvae?

Dr. Jayasankar : Unable to comment. However if adult profile is available, eggs and larvae can be identified.

Dr. Daniel Selvaraj : Can preserved samples be used for DNA marker studies?

Dr. Jayasankar : Yes.

Dr. Daniel Selvaraj : How much time is needed to analyze one sample?

Dr. Jayasankar : About 3 days.

Dr. Paul Raj, Head PNP Division, appreciated the efforts being taken up by Dr. P. Jayasankar for the application of RAPD and AFLP techniques for identification of genetic stocks of Indian mackerel and oil sardines under the project PNP/49.

The session was concluded with vote of thanks by Dr. Daniel Selvaraj at 4:20p.m.

Dr. P. C. Thomas.
Rapporteur

Intellectual Property Rights and Patent Awareness

Presented by *24.08.01*

Dr.K.S.Mohamed,
Scientist (Sr.S)
Molluscan Fisheries Division
CMFRI,Cochin.

Presentation

The seminar was based on the training cum workshop on IPR awarness and WTO training attended by Dr. K.S.Mohamed at Directorate of Rice Research, Hyderbad during 10 to 12 July,2000. After this he also attended a seminar on Patent Awarness organized by STIC, CUSAT at Cochin on 16.07.01.

Considering the freshness of the topic to the scientific audience of CMFRI and its significance in the coming years, Dr. Mohamed started the seminar by an elaborate, descriptive introduction on different aspects of Intellectual Property Rights. The role played by the World Trade Organization (WTO) with 140 member counties *(covering 94% of world trade)* to promote and liberalize global trade and its basic principles was described. Citing relevant events *(such as the patent for Basmati Rice, Champaign)*, the concept of Geographical Indications was elucidated. This was followed by an informative description of : patent, what is patentable and what is not. He enlightened the audience on how to obtain a patent and the processing channel of a patent application in India and abroad. The significance of patent filing date was highlighted and patent validity under new rules (*20 years*) were also presented.

Dr. Mohamed listed the cost of a National Patent, US patent, PCT basic fee and the annual patent maintenance fee. The importance of IPR and its significance in R&D and tracking technology trends were stated. The influence of patenting on publication of research findings was perceptible by the fact that only 20% was published in journals and the rest of the information in the documents related to patent which is not freely and easily accessible by the user. To bring home the point, web pages providing information on patents approved for cultured pearls and production of tetraploid shellfish was presented before the audience. The presentation was concluded by analyzing the patentable items/ themes in CMFRI.

Discussion

Interactions, which followed the presentation, covered different aspects of IPR. Dr.Jayashanker,Scientist (Sr.S) wanted clarification of the terminology's, *' product '*and *'process '*. Dr. Mohamed explained that a patentable *process* is a new method or a new procedure to produce something, while *product* is something, which is entirely new. Dr. Rajagopal, Head, FEMD, stated some of the reasons for delay in getting a patent. Dr. Noble wanted to know whether credit will go to the scientist who produces a patentable item or to the Institute to which he belongs. Dr. Mohamed answered that as it is the

Government / organization which provides the facilities it should be the Organization and the individual may be given a royalty similar to the copy right of a book.

Discussions went on to patenting written material such as *Bulletin*. Dr.R.Paul Raj, Head, PNPD, enquired about the period for which a patent is valid. Dr.Mohamed replied that copyright for the author is - for life, followed by 60 years. Quoting an example he said that this is the reason why music cassette of Beethoven is priced low (Rs. 25) and the present day music albums (*as that of Bryan Adams*) are rated high.

Dr.(Mrs.) Sivakami, Principal Scientist, DFD wanted more information on selling a a patent. Dr. Mohamed gave a clear outline of the procedure and stated that if the technique is good it can be patented from anywhere. Nationality is important, and in India only 60 to 70 % of patent applications are approved. There is no inhibition on submitting a patent elsewhere.

Dr. Ramachnadran, Scientist, SEETED, raised the query whether we can still be optimistic about patenting, considering the procedural delay . Dr.Mohamed replied that there is no reason to be disheartened, even though there are many hurdles. CIFT has submitted an application for patenting their technology but ICAR is still not satisfied and hence it has not reached the patent office yet. However, when the new law comes into force it will not be so difficult. Dr. R.Paul Raj, stressed the importance of maintenance fee, if the technology is not good there will be no users and it will be an additional burden to pay the maintenance fee. Dr. Mohamed briefed about the patents applied by NIO, about 35 patents 4 years ago and how they try to apply from USA.

The students also participated in the discussion. They wanted clarification on whether after the stipulated period is over whether it can be renewed. This was clarified by stating that a patent can be continued with fresh application seeking extension.

Remarks

The presentation was very informative, covering all aspects of the subject in a simple, descriptive and perceivable manner. The illustrations were apt and the interactions vivid. To facilitate the audience to collect more information on IPR and Patent awareness, Dr. Mohamed also listed some of the web sites and literature.

Kripa. V

Dr. V. Kripa
Rapporteur

SEMINAR BY SHRI. BALAN, K. FRAD, CMFRI, COCHIN

TOPIC: *RING SEINE OPERATION IN KERALA AND ITS IMPACTS*

14-09-2001, 15.15-16.30 HRS.

ROOM NO. 30[illegible]

PRESENTATION

Kerala occupies the foremost position in marine fish production in India, accounting for almost a quarter of the total production of 2.4 million tonnes. The coastal line of the state is about 590 km and 186 landing centres are distributed along the coast. The marine fish production in Kerala during 2000 is estimated at 6.04 lakh tonnes. The production, on average (1991-2000) has been at 5.67 lakh tonnes. Three distinct sectors could be seen in the marine fisheries of Kerala viz. Mechanized, Motorized and Non-motorized (Artisanal) contributing 39% (2.35 lakh tonnes), 57% (3.47 lakh tonnes) and 4% (0.21 lakh tonnes) of the total catch during 2000. It was noticed in Kerala that whenever there was a technological change in fishing practices, the production rose to a higher level and got stabilized till another change gave it a momentum to rise again. Also this rise in production has been of high magnitude when the technological change was directly in the traditional fishing method. Ring seine is a major gear in Kerala contributing around 41 % to the total production during 2000. Ring seine can be called a mini purse seine. Its size ranging from 600 - 900 m long, mesh size of about 20 mm The number of crew ranged from 32 to 38. Ring seine is mainly used to exploit pelagic group of fishes. Due to high efficiency of the gear there is an overall increase in marine fish production and this enhanced the availability of fish resources to the common man at affordable rates. It also increased the employment opportunities as the size of the craft and gear is increased. On the other hand the disadvantages are high operational cost, sectoral conflicts and removal of bulk quantity of juveniles of various resources. The study is well documented and supported by a series of graphs and tables on the contribution and trend of ring seine operation in total catch effort and CPUE at national, state and district levels.

DISCUSSION

Dr. Satyadas: Can you say that regeneration is affected by ring seine operation? There is no considerable reduction in catch and the yield effects based on CPUE is not justified.

Shri. Balan: Large quantity of juveniles are being taken away especially when we use 8mm mesh size,but there is no standardized procedure to quantify that.

Dr.NGK Pillai : Use of ring seine(<100mm mesh size) has been banned by the government

Dr. Srinath: There was a ban

Dr. NGK Pillai: Here Cpue is showing an increasing trend , But in a recent study CPUE was showing a decreasing trend. What is the reason for that?

Dr.Srinath: If we consider the data upto 1998, there is a decreasing trend, and during the 99-2000 period there is an increase. Again we can not entirely depend on CPUE. It can be misleading mainly due to changes in total catch.

Dr. Kaladharan: Number of landing centers has decreased , Why?

Shri. Balan: Fishing activities are shifted to the major centers because of the high marketing facilities.

Dr. Satyadas: Whether disparity between rich and poor increased or decreased ?

Shri. Balan: In general positive impact is there.

Shri. Daniel Selvaraj: Oil sardine catch is high in Aleppey and Kozhikode districts. Is it because of the ring seine operation?

Shri. Balan : Ring Seine is a major gear in these districts.

The semiar ended by 1615hrs and Shri. G.S.D. Selvaraj thanked Shri Balan for the nice presentation. He also thanked everybody for actively participating in the disussion.

Some of the researchable issues

- Need to develop and standardize a procedure to quantify the removal juveniles.
- Studies to find the optimum number, size and mesh size of ring seine.
- Study on the economic conditions of the fishermen.

Kochi

20-09-01

GSS

(Dr. Somy Kuriakose)

Rapporteur

Problems of Lobster Farming in India
(Seminar by Dr. E.V. Radhakrishnan)

Date: 5.10.2001 Time: 3.15 p.m.

Lobsters are a low volume, crustacean resource of high export value. Nearly 40-50 % of lobsters landed are undersized with low unit value and these can be fattened so as to increase their value. However, large scale lobster farming is not feasible, as the hatchery technology for commercial level seed production is yet to be perfected. Larval cycle of spiny lobsters is prolonged and though several species of temperate species have been reared from egg to postlarvae survival is low. Unlike shrimps a compounded artificial diet is yet to be formulated to that commercial fattening can be carried out. Currently, value addition to low priced lobsters by short term fattening is possible.

Dr. S. Sivakami	What is the feed given during fattening ?
Dr.E.V.Radhakrishnan	Clam is given mainly. At Chennai, mussels were also used. Trash fish also can be used – but then the colour is lost. So this can be used as a supplement only.
Dr.R.Paul Raj	Do the fishermen release berried lobsters at the spot of catch?
Dr.E.V.Radhakrishnan	The fishermen sometimes remove the egg mass and sell the catch. So we have to increase awareness among them .
Dr. R. Paul Raj	You are doing research for 25 years. You are trained abroad also. What are the major constraints ?
Dr.E.V.Radhakrishnan	The conventional system is not good enough. With conventional aeration, larvae are disturbed. But with the revised system we can achieve larval rearing. Larvae feed on artemia when they are young. We can try mysis.
Dr. R. Paul Raj	What is the particle size of feed given at the 7^{th} stage?
Dr.E.V.Radhakrishnan	3-4 mm size pieces are given for feeding. Mussel gonad – (female) – is better. Because of colour it will be visible.
Dr. R. Paul Raj	Then, can mysis be used?
Dr.E.V.Radhakrishnan	It was only my suggestion.

Dr. R. Paul Raj — What about artemia?

Dr.E.V.Radhakrishnan — Artemia nauplii move too fast and may not be suitable for later stage larvae.

Dr.T.S.Velayudhan — Any reference to improve the available rearing technology?

Dr.E.V.Radhakrishnan — Water quality is important. The rearing system and suitable larval feeds are areas, which need immediate attention. Even pens are suggested. However, we do not know how far it is feasible. Some people also suggest sea-ranching.

Dr.T.S.Velayudhan — But puerulus stages were collected when people went for spat collection.

Dr.E.V.Radhakrishnan — Post larval abundance was studied at Kovalam also. But 12-16 months period may not be economic for farming.

Dr. Imelda Joseph — Indoor system – is it feasible?

Dr. E.V.Radhakrishnan — In Indoor system – lobsters are healthy and we have a control over the stock. High stocking is possible with good water management (25 nos/$m^{2)}$. Because of the high value of lobsters, we can think of this. Here we can see the animals and their colour and manage the system better than in pond culture system.

Dr.Imelda Joseph — But that will be more expensive !

Dr.E.V.Radhakrishnan — No. In fattening you spent Rs. 1 and get a profit of Rs.1.

Dr.P. Jayasankar — What is the stock size? Over or under exploited.

Dr.E.V.Radhakrishnan — Northwest coast shows alarming depletion of *T. orientalis*. A gradual decline is seen generally. There is no control on fishing and now the MPEDA is bringing in a minimum legal size recommended by CMFRI. Also the egg-bearing lobsters should not be exported. In many countries, they have strict regulations.

Dr. R. Paul Raj — With your experience, suggest the most suitable area for setting up a lobster hatchery ?

Dr.E.V.Radhakrishnan — We have established one at Calicut. Kovalam is a good location too. Also Vizhinjam is a good area.

Dr.R.Paul Raj — Is the water quality at Calicut good, especially for a hatchery?

Dr.E.V.Radhakrishna — We can purify the water with our modern technologies.

Dr. S. Sivakami — Is the deep sea lobster exploited?

Dr.E.V.Radhakrishnan — Yes, they are exploited mainly from 200-250 m, to where they move in from deeper waters for breeding. And juveniles are also caught. This may lead to over exploitation.

Researchable topics

1. Live feed development for culture of lobster larvae
2. Nutritional requirement of spiny lobsters

22/10/2004

(Dr. Mary K. Manisseri)
Principal Scientist &
Rapporteur

SEMINAR BY DR. P.C. THOMAS, PRINCIPAL SCIENTIST, DIVISION OF PHYSIOLOGY, NUTRITION, PATHOLOGY AND GENETICS, CMFRI, KOCHI-14

Topic: "PCR based molecular detection of fish and shellfish pathogens"

19th October 2001, 15:15 – 16:30 h

Room No. 301

PRESENTATION

Polymerase Chain Reaction (PCR) based molecular detection of pathogens is rapid, sensitive and specific. It can detect latent forms of infectious and carrier animals. PCR is a technique for *in vitro* chemical synthesis of copies of a given DNA sequence. DNA has long chains of 4 types of nucleotides (A, T, C & G) joined by phospho diester bonds with a 5' end and a 3' prime end. DNA is double stranded held by hydrogen bonds between complementary pair of nucleotides, namely A=T and G≡C. The strands of DNA are antiparallel.

When heated to about 90-94°C, the DNA gets denatured and the strands would get annealed when cooled. The ingredients required for setting up a PCR are template DNA, primers, dNTPs, polymerase enzyme and buffer. Essentially there are three steps, (a) denaturation at 95°C, (b) annealing of primer at 35-55°C and (c) primer extension at 72°C. Quantity of DNA template is amplified exponentially in a polymerase chain reaction.

PCR technique is useful to detect and identify fish and shellfish pathogens by amplifying species specific genes. Detection of white spot disease causing baculovirus has been achieved principally through PCR and this was demonstrated using the results obtained in CMFRI biotechnology/Genetics laboratory. 'Nested PCR' enhances the sensitivity of PCR-based detection of pathogens. Arbitrarily primed PCR is often used to

detect fish and shell fish viral pathogens. Dr Thomas has also presented schematic representation of amplification of tdh_2 gene of *V. parahaemolyticus* as well as ctxA gene of *V. cholerae*.

DISCUSSION

Dr. P. Jayasankar: How can we prevent self-annealing of primers during PCR?

Dr P.C. Thomas: Certain conditions have to be satisfied, including 40-60% G-C content, random distribution of nucleotides in the primer, absence of repeats of a particular nucleotide, etc.

Dr. V. Chandrika: What is requirement of culture conditions to detect viral pathogens?

Dr P.C. Thomas: Two ml of log phase of culture is centrifuged and DNA is extracted using a simple protocol, much shorter than the conventional phenol-chloroform extraction.

Dr. E.V. Radhakrishnan: Any report on integration of white spot virus genome into prawn genome?

Dr. Chandrakanth: Not reported. Dormant infection only seems to be possible.

Dr. E.V. Radhakrishnan: Is the infection entering the system horizontally? Is it possible to produce disease resistant prawns by selective breeding?

Dr P.C. Thomas: It is essential to stringently optimize the reaction conditions of PCR. For selective breeding, large numbers of founding parents are a prerequisite, otherwise inbreeding depression is resulted. Application of biomarkers and adopting *post facto* selection are possible.

Dr. P. Jayasankar: Is there any report on transgenic prawn resistant to viral pathogenicity?

Dr P.C. Thomas: Not aware.

Dr Imelda Joseph: Comment on the primer selection for viral detection

Dr P.C. Thomas: Primer designed by us and synthesised locally by a commercial company.

Dr R. Paul Raj: How PCR is superior to western blot/dot blot, etc.?

Dr P.C. Thomas: Early detection of pathogenicity is possible through PCR.

Dr Chandrakanth: Comment on phylogenetic relationship of white spot viruses?

Dr P.C. Thomas: Work progressing in studying the viral sequences.

Dr Mary Manissery: How much the lab is charging for PCR based viral detection?

Dr P.C. Thomas: Presently it is free. There is scope to explore the possibility of using eye stalks of prawn to extract and detect viral DNA.

Dr R. Paul Raj: There is great scope for application of molecular diagnostics in fish and shellfish disease management. CMFRI should design our own primer. It is essential to develop Quick Health Management strategy.

Kochi

22nd October 2001

22/10/01

(P. Jayasankar)

Rapporteur

Topic	**: Histology of mantle and pearl sac of *Pinctada fucata***
Presented by	**: Shri. T.S.Velayudhan, Principal Scientist, MFD.**
Date & Time	**: 02.11.01, 15.00**
Rapporteur	**: Dr.V.Kripa, Senior Scientist, MFD.**

Shri.T.S. Velayudan, Principal Scientist, MFD gave a talk on the **Histology of mantle and pearl sac of *Pinctada fucata*** on 02.11.01. After a brief presentation on the technique of pearl culture, the structure of mantle in *Pinctada fucata* was detailed. The methodology for making sections of pearl sac formed in implanted oysters was explained. The presence of different types of cells such as secretary and vacuolated cells in the mantle was explained. Different uses of pearl nacre and its importance in the Ayurvedic preparations were also highlighted. Shri Velayudhan explained in detail the following aspects

- Different methods of nucleus implantation
- Methods of genetic application in pearl culture
- Pearl sac formation in healthy and weak oysters
- Graft tissue and its relevance in pearl sac formation

The present status of tissue culture and the problems related to pearl mariculture were also briefed to the audience, which consisted of Principal scientist, scientists, technical staff and scholars. The presentation was followed by an interactive session with the audience.

Dr.R.Paul Raj, Head PNPD, wanted to know more about nacre color change due to pollution. Shri Velayudhan explained about the chemical quality of the water and its effect on the nacre. However the level of heavy metals should not affect the survival of the oyster. Dr. S.Sivakami, Principal Scientist, enquired about the source of fresh water pearls, to which Shri Velayudhan replied as China. She further wanted to know the reason for the high price of marine pearls when compared with freshwater pearls and also the method to distinguish marine pearl. Shri. Velayudhan explained about the chemical structure of the marine pearl and also the treatments for identification.

Dr. Rajagopalan, Head FEMD asked for the details on on-shore pearl culture. Dr.K.K.Appukuttan, Head, MFD gave information on the requirements for this technology.Shri Velayudhan gave additional information on the significance of water quality on nacre formation and also on the quality of the nacre. He stressed the fact that if the culture mediums are good then it can have positive effect on the colour and luster of the nacre, but if adverse conditions prevail, then the pearl sac may not form or if it has formed then the quality of pearl will be extremely poor and unacceptable. On the same subject, Dr.K.J.Mathew wanted clarification on the results of the programme undertaken at Vishakapatnam Research Center of CMFRI. Dr.K.K.Appukuttan gave an account of the high expenditure incurred for the production of food for the pearl oysters. About 30 to 40 % increase in production cost for the preparation of algal feed is seen which will also be reflecting in the profit earned. He also indicted the low market demand for small size (3 to 5mm nucleus). After a culture period of 10 to 12 months, the technology may not be

profitable. Dr. Appukuttan also stressed the importance of marketing in pearl mariculture programmes.

Shri. G.Daniel Selvaraj, Principal Scientist, FEMD, wanted to know about Half pearls. Shri Velayudhan, gave a detailed account of the production techniques of half pearls production and also on the pearls produced by abalone, *Haliotis* sp. He also explained the pearl culture programme of Shri Narasimha Rao, a fresh water pearl farmer from Andra Pradesh who produced images of Hindu Gods and other popular items by placing them in the mantle cavity was explained to the audience.

The presentation was very informative and the interactive session, which followed this, was lively and educative. The function was well attended by scientific staff and scholars of the institute.

Kripa. V.

(DR. V. KRIPA)

Technological Empowerment of Fisherwomen through Fisheries Extension
Dr. S. Ashaletha, SEETT Division, CMFRI.
21-12-2001

This seminar analysed the dynamics and various dimensions of the issues riddling women in different sectors of capture fisheries based on the results of a study conducted in Kerala, a model fishery state of the Peninsular India. The major problems experienced by fisherwomen in different sectors like prawn peeling, fish trading, sorting, net making, curing, export oriented processing, value addition and sea weed collection were brought to light. The structural changes brought about by the introduction of synthetic nets have almost displaced the women involved in net making. Introduction of automation in harvesting and post- harvest activities are more oriented towards men. Interestingly, the perception of fisherwomen on the constraints often varied from that of researchers and development agents. Gender discrimination and consequent wage disparity were not perceived as important problems by the fisherwomen. Likewise illiteracy and technological marginalisation were also not attributed much significance, which shows the lack of "conscientisation".

Based on the results, a model women empowerment strategy was presented, which would be of much use to the researchers, development planners as well as the policy makers who endeavor ways to foster fisheries development.

Discussion

1.Dr.Nandakumar: Whether MPEDA is having any specific financial support for women empowerment and , if so how much is reaching the fisher women?

Dr.S.Ashaletha : They don't have any specific financial support programmes for women in fisheries. However they have promulgated some guidelines for the construction and operation of peeling sheds in order to reduce the drudgery of the women peelers. But among the 700 peeling sheds in Kerala only very few of them satisfy these standards.

2.Dr.Daniel Selvaraj : What CMFRI can do for empowerment of fisher women?

Dr.S.Ashaletha: CMFRI has already developed many women friendly technologies like Mahima shrimp feed. We can improve the income earning capacity of women by imparting training on the various mariculture technologies developed by the institute.

3.Dr.Kaladharan: When compared to the Versova fishing village in Mumbai , status fisherwomen of Kerala, despite the high literacy rate , is much low. Why?

Dr.S.Ashaletha: The main reason is the difference in the value system of these two socities. For eg. In Kerala un- married girls are not supposed to engage in fish marketing activities while most of the post-landing operations in Versova are done by the women. The fish vending ladies in Kerala, often middle-aged, are facing severe competition from male vendors as they are reluctant to ride two-wheelers and this has marginalised them to a great extent.

4.Dr.R Sathiadhas : Is there any gender bias in fisheries technologies?

Dr.S.Ashaletha: Yes in many sectors it is visible. For instance , in clam fisheries the clam collecting device (*Palli)*developed to increase the efficiency is not suitable for the women engaged in this sector as it is too heavy to handle.

In his concluding remarks Dr.R .Sathiadhas emphasised the need for developing location specific as well as women friendly technologies in capture and culture fisheries. The SEETTD is already engaged in analysing the problems ~~that~~ experienced by the fisherwomen in order to devise suitable development strategies for empowering fisherwomen. He also mentioned the success of mussel culture being undertaken by Women SHGs of North Malabar area.

Dr Daniel Selvaraj gave the vote of thanks.

02/04/02

(Dr. C Ramachandran
Rapporteur)

SEMINAR BY DR.M.SRINATH,
PRINCIPAL SCIENTIST & HEAD,
FISHERY RESOURCES ASSESSMENT DIVIDION.

TOPIC: ECOPATH MODELLING
DATE: 18-01-2002 15:15hrs to 16:30hrs.

PRESENTATION:

For the assessment of stock and resource evaluation single species models are normally used. The popular models are micro analytical models like Beverton and Holt's models, Virtual Population Models etc., and Surplus production models such as Schaefer's model, Fox's model etc. The drawback of these models is that fishery independent factors like environment, biological interaction etc. have no role in these models. In multi species virtual population analysis predation mortality is also considered and data on stomech content is required to estimate predation mortality.

In 1984 Polovina used ecopath modelling to study the ecosystem of coral reefs using only the conventional estimates. The basic equation used in ecopath modelling is

Production = Predation + Fishery + Other mortalities + Bio-mass accumulation + Net migration.

Data requirements for such analysis are biomass, production/biomass, consumption/ biomass and ecotropic efficiency. In ecopath analysis, the resources in an ecosystem are grouped (up to 15 groups) to form ecological groups and for each group we have to input quantities

P/B which can be estimated as Z (total mortality coefficient).
Q/B Food consumption
EE Ecotrophic efficiency

Eco-path analysis gives the status of the ecosystem as a whole and the status of a specific resource of the ecosystem will not be available. The "Ecosim" is a time dynamic simulation tool to study the effect of policy options on the ecosystem. Ecosim can be used to understand the dynamics of the ecosystem under different management regimes. The ecopath models are not valid for highly seasonal environments and there are no meso-scale spatial relationships.

DISCUSSION

Dr.Jayasankar: How the software can be used to study the effect of fishery on the ecosystem in terms of effort and other parameters. What are the data requirements?

Dr. Srinath: Using ECOSYM we can simulate and see how to tune the fishery for a healthy ecosystem. Management options will be only for the ecosystem as a whole and

will not be available for individual species. Data required are diat composition data, production, biomass and estimates of mortality Z.

Dr.NGK Pillai: There is a statement in a report of ADB-RETA project that 40% of the harvestable biomass is only exploited. How this was arrived at ? Whether such analysis can be done for a single species? (also suggested to form a working group and start using the model and software).

Dr. Srinath: It was based on the output of ecopath analysis carried out with limited data available and the conclusions are useful even with limited information. Similar analysis can be done for single species by treating it as a group with only one element and in such cases the number of groups will increase. Learning about the ecopath modelling and revalidation of the model is time consuming and we have to identify people for this.

Dr.R.Satyadas: How economic data can be applied in ecopath analysis. What is the difference between bio-economic modelling and ecopath modelling.

Dr. Srinath: Bio-economic modelling does not take into consideration the species interaction where as it is accounted in ecopath modelling.

Remarks of Director, Prof(Dr). MJ Modayil : I have been watching the models of Daniel Pauly and others for quite a long time. In tropical conditions it is important to understand about lakhs of varieties of interacting organisms where as in temperate regions comparatively few species exists. In tropical conditions the animals have a large menu for their diet, have faster metabolisms. When observed, there are seen animals with empty stomach for even six months continuos samples. It is necessary to generate reliable data, which is a matter of concern. We have to select a small ecosystem and study the system intensively and have a trial with echopath analysis. The data gaps have to identified and filled. There may be inconsistancy in the model, even then it gives a good picture.

Dr.Nandakumar: Whether the recommendations from the analysis will change as we go for value instead of production?

Dr. Srinath: Definitely it may change and there may be conflict.
Shri. Danial Selveraj: Explain the term lightly exploited?

Dr. Srinath: The ratio F/Z can not be used to judge whether a resource is fully exploited or not. It is better to see whether there is gradual decline in CPUE to conclude it is over exploited.

Dr.V.S.R. Murty narated the history of using models like Beverton & Holts model and about the reliability of ELEFAN method of growth parameter estimation. The performance of the model will depend on how efficiently we generate the necessary data. We have to consider how we generate useful information for this. We should look at the designing the data collection and should follow it strictly. He asked about the loss if we continue to use the traditional method. Is the model final?

Dr. Srinath: There is no loss. Studying the trend in catch and CPUE is the best procedure to assess the resource. Ecopath model is finalized but ecosym is not finalized. Details are available in the web site www.ecopath.org.

Dr. Noble : Is there any way to validate the model?

Dr. Srinath: Validation can be tried on mariculture ponds.

Shri. Danial Selvaraj thanked the speaker and the audience and the seminar was over by 16:30 hrs.

(Sathianandan.T.V.)
Scientist (Sr. Scale)

Cochin,
08-02-2002.

THE DIVISIONAL SEMINAR OF CMFRI
Presented by Dr.M. Rajagopalan, Head, Fishery Environment and Management Division

"SEA TURTLE CONSERVATION AND MANAGEMENT –PRESENT STATUS"

PRESENTATION:

The Sea Turtle Fauna of the world comprise seven species of which five species inhabit the Indian waters and are found all along the coast including the Lakshadweep and Andaman-Nicobar Islands. All the five species undertake long distance migration. They are,

1. *Lepidochelys olivacea* – Olive ridley turtle
2. *Chelonia mydas* – Green turtle
3. *Eretmochelys imbricata* – Hawksbill turtle
4. *Caretta caretta* – Loggerhead turtle
5. *Dermochelys coriacea* – Leatherback turtle

Olive ridley is the most common sea turtle in India and the mass nesting of the species occurs every year in a stretch of 15 km on Gahirmatha beach in Orissa during January-March. Nesting is found on the east and west coasts including the Bay Islands. Failure of mass nesting reported during 1997-98, however, 3.4 lakhs nested in the season during 1999 along Gahirmatha, Rushikulya and Devi River mouth area in Orissa. Tagging experiments and observations by coast guards indicate a northward mass migration from Srilankan waters in November to reach the mass nesting grounds in Orissa coast during January-February. The second minor mass nesting occurs in March. The mating turtles are seen usually in the shallow waters from 50m to 5 km from the shore during October-December. Green turtle is the largest species and is highly priced and there was a directed fishery of the species in the 1970s in the Gulf of Mannar and Palk Bay area in Tamil Nadu.

Exploitation of the fauna:

The sea turtle fauna of India are protected in the wild Life (Protection) Act 1972 as endangered species in Schedule I. In spite of this Act, exploitation of millions of eggs and poaching of adult turtles were in practice till the early 1980s. adult Olive Ridleys of both sexes numbering 50,000-80,000 were estimated to be massacred in each nesting season off Gahirmatha upto 1981-82. From 1983 marketing of turtles and directed fishery of turtles were stopped in Orissa. Directed fishery using spiral type of wall nets existed in Palk Bay and Gulf of Mannar. Between Pamban and Kanyakumari 3,000-4,000 turtles were estimated to land every year of which Green turtle formed 75% while O.ridley and Loggerhead together constituted 20%. Turtles were exported to SriLanka, and their shells to France, U.K. and other countries. Directed fishery for meat and shell during nesting season,

catching of eggs for human consumption and predation by dogs, jackals and birds, unexpected sea erosion wiping away millions of eggs and incidental catches by fishing gears especially gill nets and trawl nets are the agents of annihilation for sea turtle fauna in India. Gill nets played a key role in causing maximum mortality in most of the maritime states – 76.5% by gill nets and 17.8% by trawl nets and the rest through shore seine, boat seine and hooks and line. Stranded turtles during November-February were the largest in 1996. During 1998 around 16,000 Olive ridley carcasses were washed ashore due to entangling along Gahirmatha beach and around 73% were nesting females. Incidental catches along the Indian coasts for a period of 3 years – 1996-1999 show that Tamil Nadu tops with 65.1% followed by Andhra Pradesh, Orissa, West Bengal, Maharashtra and Karnataka. The data show that the south east and North east coasts account for 90% of mortality which it is only 10% in the South west and North west coasts.

Conservation and Management:

The focal theme of the presentation was to highlight the research conducted on the multifaced fishery of sea turtle fauna of India by the FEM Division in CMFRI. An awareness among the fishermen and the public of the maritime states was created through the efforts and publications of CMFRI especially on mass nesting and the need to conserve the sea turtle fauna of India. CMFRI Special Publications, Bulletins, Marine Fisheries Information Service and other research papers were highly advantageous in realising this goal of conserving the fauna and preventing wanton destruction. CMFRI conducted a national Workshop on sea turtle conservation in 1984 in Chennai followed by an International Symposium on the endangered marine animals and marine parks in 1985 in Cochin. The proceedings brought to light the new findings on the fauna.

The National Marine Living Resource Data Centre (NMLRDC) of CMFRI collects data on the incidental catch, mass nesting and other details of the five species of sea turtles from all the fish landing centres around the Indian subcontinent. CMFRI developed a national programme for surveying and demarcating nesting grounds of sea turtles along the Indian coasts and bay Islands; hatchery and release of hatchling and tagging of turtles to know more about the population structure, growth and mortality rates. CMFRI has in depth knowledge about the mass nesting on the Gahirmatha and Tamil Nadu coasts. CMFRI developed a hatchery for the Olive ridley for the first time in India at Kovalam near Madras in Tamil Nadu and conducted a recovery programme for the 55,000 hatchlings released into the sea during 1978-86. Hatchlings were reared for four years to study growth rate.

TED- Turtle Excluder Device was first introduced in USA in 1980. It was modified to use in trawler nets by the Central Institute of Fisheries Technology (CIFT) to minimise incidental catch mortality. Two Workshops, first at Paradweep in 1996 and at Cochin in 1997 were conducted followed by demonstrations in

Visakhapatnam and in Digha in West Bengal. The TED used was George Jumper Type and was found Cent percent successful.

India is a member of the CITES – (Conservation of International Trade in Endangered Species of Fauna and Flora) – which prevents trade in turtle products by the members. The mass nesting ground along Gahirmatha coast and Bhitarkanika both in Kanika Island including several beaches and offshore islands in Orissa and Chilka Lake under UNDP were declared as Wildlife sanctuaries. There are 4 national parks and 17 protected areas and 94 sanctuaries in Andaman-Nicobar islands. Sea patrol and surveillance for strict enforcement of the Acts and Legislations effectively prevented poaching and directed fishery of sea turtles. Maritime states, Union territories, non governmental agencies and Universities are now engaged in sea turtle conservation activities. Based on conservation and management, incidental catch decreased enormously, and following the ban of 3 km within the inshore areas by mechanised boats critical areas of mass nesting were protected. There was no reduction of nesting females along the mass nesting areas. Developing hatchery and recovery programmes of hatchlings are very essential for conservation and it should be maintained effectively in the coming years. There must not be any lapse in the strict enforcement of laws and legislation.

Researchable Issues:

Research pertaining to biology, ecology, reproductive physiology, endocrinology and behaviour pattern of the different species should be taken up.

Setting up of hatcheries for the different species and recovery programmes should be started.

New areas apart from the already identified habitats should be located.

Education, training and extension among the fishermen and public even for children on the importance of turtles and need for their conservation and management should be initiated and continued.

DISCUSSION

Q. 1. Dr. Sunilkumar Mohammed: Why are the sea turtles found in abundance along the upper east coast?

Dr. M. Rajagopalan: The upper east coast has ideal mangrove forest area from time immemorial. There is some kind of imprinting mechanism among the hatchlings. They crawl and come back to the same habit year after year. Recently a slow movement towards south is noticed to the major river mouth areas. The sense of productivity is very high among hatchlings. This may be one of the factors aiding in mass movement.

Q. 2. Dr. E.V. Radhakrishnan: In the Mexican coast there were 40,000 sea turtles. Now only 40 are there within a span of 20 years. Hence Defence Personnel are engaged in protecting them. Is there any latitudinal area specificity or magnetic field which attract these sea turtles to a particular region?

Ans: I think that it is the instinct which drives them to a certain place. Lighting or defence mechanism may be the cause.

Q. 3. Dr. K.J. Mathew: How many times the sea turtles come to the same location for mating and nesting?

Ans: 3-4 times the same sea turtle may come to the same habitat for mating and Nesting. Mating takes place in the shallow waters 50m to 5 km from the shore. Satellite attraction was used in SriLanka to study this phenomenon. Monometal tags used also show that the same turtle coming to the same place at least 3-4 times.

Q: 4. Shri Daniel Selvaraj: Do you think that the soil texture may have some role for the sea turtles to visit the same place again and again?

Ans: Correlation between soil texture of the habitat and the frequency of visiting by the turtles has not been found so far. No work exclusively on the effect of soil texture has been done on this aspect.

Q: 5. Dr. K.J. Mathew: Has the ban on sea turtles increased the stock?

Ans: There was so much depletion of the stock as I have already told you. The population did not show any decrease as evidenced by the number of sea turtles coming to nesting area.

Q: 6. Shri Daniel Selvaraj: Has there been any survey to know the increase of the population of the sea turtles?

Ans: Lot of awareness has been created among fishermen and the public about the need to protect and conserve the sea turtles. Consequently the number of mass nesting turtles reaching the nesting grounds has been on the increase during the recent years. The ban and strict enforcement of law helped a great deal in protecting them. Apart from these there was no survey as such has been conducted to know the increase.

Q: 7. Dr. Reeta Jayasankar: What about the food of green turtles?

Ans: The green turtles consume nearly 1.5-7 lakh tons of sea grasses annually. Very little research has been conducted on green turtles.

Q: 8. Dr. Imelda Joseph: Where do the female turtles go after nesting?

Ans: The females remain in the nesting ground close to the shore after nesting. The males go back to the place from where they have come.

Q: 9. Dr. Reeta Jayasankar: How many times the females visit the same place?

Ans: More than three times the same females visit the same nesting ground. It is reported that the same females have come to the Gahirmatha beach after 12 years.

Q: 10. Dr. T.S. Velayudhan: Has there been any instances of poisoning in sea turtles?

Ans: Yes. There has been instances of poisoning reported in sea turtles from Tamil Nadu coast. Olive ridley is an omnivore and its feeding grounds are in SreeLankan waters. For green turtles the Pakistan waters are preferred grounds though they are purely vegetarians. The males of green turtles never come to the shore. We have information only up-to the sub-adults.

Q: 11. Dr. V. Chandrika: Is there any information on diseases affecting the sea turtles?

Ans: We have very little information on diseases affecting the sea turtles in our waters.

Q: 12. Dr. V. Chandrika: What is the reason for mass mortality?

Ans: Mainly gill nets (76.5%) and trawl nets (17.8%). Butchering for consumption is also another reason.

Q: 13. Dr. Ramachandran: What is so great about sea turtles that they are being declared as endangered species, measures are being taken to conserve and manage the population through legislation and all that?

Ans: Sea turtles play a great role in the food chain of the sea. They are our scavengers to set right the ecosystem like crows in the land. Sea turtles clear so much of waste like tonnes of fish being thrown into the sea after catching.

Q: 14. Dr. T.S. Velayudhan: We have to protect the animals and start Ecotourism on Turtles like that in Australia on Loggerhead turtles.

Ans: If we promote Ecotourism on Turtles in Bay Islands – Andaman and Nicobar and the Lakshadweep Islands and the mass nesting areas of Gahirmatha beach lot of revenue could be created for India with some planning and efforts.

Q: 15. Dr. R. Paul Raj: Why not we have Rookerys in hatchery projects: Do we have any such projects and programmes?

Ans: We have Gahirmatha Rookery. In peak summer only males are released. In Australia they have 6 species and 1 endemic sp. *Chelonia.*

Q: 16. Dr. Reeta Jayasankar: Is it possible to differentiate the sexes in the early stage?

Ans: It is not possible to differentiate the sexes externally in the early stage upto 5 years.

Q. 17. Dr. G. Nandakumar: What is the punishment under Schedule I for poaching?

Ans: The culprit will be arrested and put behind bars. It is mandatory that you have to pay fine in India if you violate Wildlife Protection Act (1972).

The Division seminar came to an end and Sri Daniel Selvaraj, Scientist-in-Charge of Seminar thanked Dr. Rajagopalan, Head, FEMD for the wonderful presentation on sea turtles. Dr. Rajagopalan was earlier an expert on deep sea water fishes, later Dr. Silas asked him to work on sea turtles. Dr. Rajagopalan continued his work further and took his doctorate on sea turtles and became a well known authority in his chosen field. Today there is no substitute for Dr. Rajagopalan and someone should take up that work before he retires as there are still a lot of problems to be tackled and targets to be achieved on sea turtles. Younger generation should come forward and take up new vistas of research in the field of sea turtles – Sri Daniel Selvaraj concluded.

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SEMINAR BY Dr.V.KRIPA,
Senior Scientist,MFD,CMFRI,Kochi

TOPIC: ***CAPTIVE BREEDING AND LARVAL REARING OF CEPHALOPODS***

Date: 05-04-02 Time: 15.15-16.15 Venue: Room No.201

PRESENTATION

Cephalopods are found throughout the world oceans and they occur from shore to open sea and from surface to deeper waters. External shelled Nautilus, Benthic Cuttle fishes,Oceanic and near shore Squids and benthic Octopus are the main groups in commercially important cephalopods. During maturity Sepidae shows distinct pairing. Lolignids exhibit spawning migration. In Todarodu difference in mating and associated behavior is seen. Here a male places sperms in to immature females which carries it till the ovum is ready for fertilization. Octopus exhibits parental care without even feeding.

The Exploitation of Cephalopods is high and that effort of conservation is underway in many countries. Taking the advantage that the squids lay eggs in hard substratum available in the breeding grounds ,biologists put twigs in tanks with brood stock of the species. The eggs laid on these twigs are then transferred in to rearing tanks.

In the breeding experiments, Waikki Aquarium was able to maintain Nautilus for a long time. Spawning can be induced by temperature manipulations. They could not rare the young ones to adult stage. Octopus lay 200-500 eggs of 10-14 mm. The stalked eggs hatch out after mothers brooding for about 30-50 days. Instead of mothers brooding, creation of a gentle stream of bubles will help the egg to hatch. The recorded survival rate after 40 days of raring is only 20%.

Sepioteuthis are small animals and that can be kept in captivity at a stocking rate of 15 animals/10 litre of sea water. In the case of Sepia pharaonis females will be active and feeds during the brooding time. Males usually accompany the females. Incubation period is 14 day. In captive condition, reduced fecundity is observed compared to that from the wild ones.

In breeding and rearing, the salinity requirement is 22-37ppt . Stocking density can be up to 500 numbers /litre for a period of 10 days. The animals require enough horizontal spacing

Major constraints in rearing is the squirting out of ink if frightened. Cannibalism is another problem. High rate of feed requirement and the need to train the animal to accept the feed are also of concern.

High demand for the animals as aquarium pet is the advantage in captive rearing of cepalopods

DISCUSSION

Shri. Nandakumar : How far the Nautilus could be reared in the hatchery?

Dr.V.Kripa : Due to the difficulty in feeding it could be reared only up to 30 days.

T.S.Velayudhan : Is there any need for captive breeding and rearing of Cephalopods ?

Dr.V.Kripa : Cehalopod fishery at present if sufficient to the market and the work is of academic interest.

Dr.M.Rajagopalan :Any funded project on this aspect is undertaken by the Institute ?

Dr.V.Kripa : Dr.SydavRao is having a project on NATP;but not yet implemented.

Shri.Nandakumar: What is the status of captive production ?

Dr.V.Kripa : Portugal is in the lead and they could produce 3 tonnes of Octopus and 1 tonne of cuttle fish and marketed internationally as aquarium pet.

Dr.M.Rajagopalan: Cephalopods can be collected live using FAD and it will be economical ?

Dr.V.Kripa : Collection through FAD will be economical but keeping wild ones in Captivity is the problem.

The seminar came to a close by 16.15 hrs and Dr. D. Noble thanked Dr.V.Kripa for the nice presentation of the topic. He also thanked everybody for attending the seminar and for their interactions.

Kochi.
11-04-02

(P.Radhakrishnan)
Technical Officer, T-6
Rapporteur

SEMINAR BY DR. SOMY KURIAKOSE, FRAD, CMFRI, COCHIN

TOPIC: *SURPLUS PRODUCTION MODELS AND THEIR APPLICATIONS*

19-04-2002, 15.15-16.15 HRS.

ROOM NO. 301

PRESENTATION

In fish stock assessment there are two types of models that are employed to study the dynamics of the fish populations.: "*holistic models*" and "*analytical models*". Models that can be solved in closed form mathematically are analytical models. For such models a general solution can be obtained which is applicable to all situations the model represent. In macro models or holistic models we deal with the observable inputs and the actual outputs from a given population. The simple holistic models use fewer population parameters than the analytical models. They consider a fish stock as a homogeneous biomass and do not take into account, for example, the length or age-structure of the stock. The analytical models are based on a more detailed description of the stock and they are more demanding in terms of quality and quantity of the input data. On the other hand, as compensation, they are also believed to give more reliable predictions.

The type of model to be used depends on the quality and quantity of input data. If data are available for an advanced analytical model then such a model should be used, while the simple models should be reserved for situations when data are limited.

Stock production models are used to assess the relationship between the sustainable yield from a population and the stock size. Surplus production models characterize the population as an undifferentiated biomass. A quantity termed surplus production is used to characterize the population dynamics at different levels of population size. These models are also known as biomass dynamic models and assume that the changes in fish population are caused by the interaction among four competing factors, namely, recruitment, growth, reproduction and natural mortality. The fundamental assumption is that the effects of the three factors namely growth, natural mortality and reproduction can be incorporated into a single function of stock size only.

The three most commonly used biomass models are *Schafer* model, *Fox model and Pella Tomlinson model.*

For Parameter estimation Equilibrium methods and Non equilibrium Methods are used. The equilibrium methods are Computationally simple, it provides estimates of Maximum Sustainable Yield (MSY) and Fishing effort to attain MSY, it does not provide the estimates of r, q, K and B, The commonly used non-equilibrium methods are Effort Averaging Methods, Process Error estimators and Observation Error Estimators. These methods were been illustrated using catch rate of Penaeid prawns of Tamil Nadu from 1989-2000.

Biomass dynamic models are either discrete or continuous. For modelling fish stocks with more seasonality in growth, reproduction and harvest a discrete production model can be used. For species characterized by relatively faster growth, constant recruitment and reduced annual seasonality in life processes, a continuous model might prove superior to discrete model.

The main features, which attract the fishery biologist to use these models are Simplicity, data requirements are limited, computational ease in estimating the modal parameters. But these models make several assumptions, which are unlikely to hold in practice.

DISCUSSION

Dr. Nandakumar : There exist many assumptions for these models. Can you suggest which model a biologist should select?

Dr. Somy Kuriakose : The type of model to be used depends on the quality and quantity of input data. If data are available for an advanced analytical model then such a model should be used, while the simple models should be reserved for situations when data are limited.

Dr. Srinath: Could you please show the value of intrinsic growth rate (r) ?

Dr. Srinath: The value seems to be pretty low. The value of r expects around 1.5 instead of 0.02. Statistically the model may be best fit. Sometimes the biological meaning of parameters is totally lost with the statistical meaning. When you analyze the biological model, you must actually understand the significance of the parameters. In this illustration, the data is showing a decreasing trend. This may be the one of the reason for the low r value.

Dr. Sunil Mohammed : I want to point out two points. One of the advantages of Non-equilibrium models is, it can project the population over a period of time. The disadvantages of the

model are the assumptions like no recruitment in the population, any loss is mortality etc. In the example of catch of Penaeid prawns of Tamil Nadu, even if you arrive in good result, you can project only about single species at a time. Can you use a number of species together? What about modeling Trawl net fishery?

Dr. Somy Kuriakose : Extensions to the model have been used for multi-species and multi-fleet fisheries.

Dr.Srinath: Trawl net fishery is a targeted fishing and mainly directed towards Prawns. From the fishing effort, you can calculate the number of unit operations; it can be useful to give advice on management of Prawn fishery. Using the simulation techniques you can generate the whole time series data, and can see the trend of the stock, how the stock collapses, when u add the noise into it. The biologist should come forward to use the novel techniques in the fish stock assessment.

The seminar ended by 1615hrs and Shri. G.S.D. Selvaraj thanked **Dr. Somy Kuriakose** for the nice presentation. He also thanked everybody for actively participating in the discussion.

Some of the researchable issues

- Extension to the model for multi-species and multi-fleet fisheries.
- Introduction of environmental variation

Kochi
20-04-02

Mini 22/4/02
(Mini, K.G.)

SEMINAR BY Dr. G. NANDAKUMAR, PRINCIPAL SCIENTST, CFD, CMFRI, COCHIN.

TOPIC: STATUS OF PENAEID PRAWN FISHERY IN INDIA

DATE 18.7.2002 TIME : 1515 To 1630 PLACE: ROOM No. 301

PRESENTATION

An account on the studies of penaeid prawn fishery of India for the period 1991-2000 was given in detail with proper presentation of facts and figures of statewise landings of penaeids with species composition and trend of fishery. A brief account on the biological aspects of prawn such as age and growth reproduction and recruitment was discussed. The multiday fishery, and fishing operations in midshelf waters and deep sea increased prawn catch of the country. Biological characteristics such as high fecundity, protracted spawning season and repeated spawning helped to maintain the yield in spite of high fishing pressure all along the coast. Stock assessment study at different centres on commercial species revealed that there was not much scope to enhance the present yield by increase in effort. Management measures to save this valuable resource such as increase in cod end mesh size of trawl, ban on minitrawl and thalluvalai operation by compensating the fishermen and limiting the stake nets being operated in backwaters were suggested.

Discussion

Dr. Imelda Joseph : At present most of the shrimp hatcheries are depending wild broodstock. Whether it has got any affect on fishery?

Dr.G. Nandakumar: I do not think.

Dr.E.V.Radhakrishnan: Added that there is no separate mechanism for catching broodstock prawns, it's caught along with the other catch.

Dr. M. Srinath : Suggested that while studying the catch composition, place of catch should be taken into consideration. For example, the catches landed at Visakhapatnam by large trawlers are actually caught from 'Sand Heads' region (off West Bengal) which are included under the total catch of Andrapradesh.

He also suggested that since the prawns are short lived stock assessment studies should be based on monthwise data. Cohort analysis on monthly basis data will be good though it gives only macroidea. Annual catch data is useful only fishes which live for 10-15 years.

Dr.P.Jayasankar : How you can propose management option based on the environment data?

Dr.G.Nandakumar : The environment parameters such as salinity and temperature play an important role in successful recruitment of prawns. They should be studied with relation to fishery.

Shri.P.E.Sampson Manickam: How square mesh is different from diamond shaped?

Dr.G.Nandakumar: In small sized meshes (25-30 mm) it is insignificant.

Dr. M. Rajagopalan: Why you said monsoon banning is not at all scientific?

Dr.G.Nandakumar: *Parapenaeopsis stylifera* constitutes 90% of the fishery during monsoon and it is not the peak spawning period for this species. During monsoon trawl fishery is restricted between 30-45 m which is not affecting the "chakara" fishery exploited by ring seines in the nearshore area. If we examine the 10 year data of prawn landings, the catch is increased marginally by 12.5% . During this period fishing effort has increased by 45% which is not economical.

Dr.P.N.Radhakrishnan Nair: Added that during the trawl ban period biological growth of prawns are taking place; they get a chance to grow further for a period of 45 days.

Dr. M. Rajagopalan: When there is no estuarine system like in Tamil Nadu, which area is utilised for nursery?

Dr.G.Nandakumar: Near-shore areas are utilised. For example along the coastal areas of Pamban (SE coast) where lakhs of *Penaeus indicus* postlarvae are available.

Dr.E.V.Radhakrishnan : Other than mesh size regulation/ban what are the other methods? Whether quota system will work out?

Dr. G.Nandakumar: Quota limitation is a good idea. But it is not ~~a good idea~~ possible to practise in India.

Shri P.E. Sampson Manickam: Brought to the notice that in some areas very small shrimps are caught and utilised for making shrimp paste. In areas between Devipattinam and Athiramapattinam of SE coast, thalluvalai (tradition gear) fishing is very active and very small prawns (500 counts) are being caught. The fishing is during night hours and landings are over well before 6 a.m. Hence, our survey staff (FRAD) may not get a clear picture of this fishery since it is before the existing forenoon observation hours.

Shri. G.S.Daniel Servaraj: Spawning ground for *P. stylifera?*

Dr.G.Nandakumar: The regular fishing ground at a depth between 10-15 m.

The seminar came to close by 1635 hrs and Shri G.S.D. Selvaraj thanked Dr. G. Nandakumar for the good presentation of the topic. He also thanked Scientists, Technical Staff and students for their active participation.

Researchable issue

Continuous monitoring of shrimp fishery and stock assessment are necessary for the conservation and management of the natural stock.

Kochi-14,
20.7.2002.

(Josileen Jose)
Scientist (SS) &
Rapporteur

Seminar by Dr. Mary K. Manisseri, Principal Scientist, CFD, CMFRI, Cochin.

Topic: Growth Efficiency in *Metapenaeus dobsoni* when exposed to Copper and Mercury at sublethal levels.

Date: 20.9.2002 Time: 1515 to 1615 Place: Room No.301

Presentation

The seminar covered four different aspects namely, energetics including Assimilation, Gross growth efficiency and Net growth efficiency, histological studies of hepatopancreas, Ultrastructural variations and accumulation of Lipofuscin and unsaturated neutral lipids. It was pointed out that though low levels of heavy metals does not affect the behavioural patterns, rate of feeding or assimilation in the animals, both the gross and net growth efficiencies decreased considerably. This was because a part of energy which would have been utilized for somatic growth was utilized for maintenance. The anatomical and ultrastructural damage done to the hepatopancreatic cells was explained with the help of slides. Accumulation of unsaturated neutral lipid and lipofuscin as a result of heavy metal toxic and their use as biological indicators of stress was explained. The biphasic effect of copper and the production of highly enlarged heterogenous secondary lysosomes as a result of heavy metal stress were also explained.

Discussion

Dr. Jayasankar	Whether any harmful effects are there consuming 'stressed animals'?
Dr.Mary K.Manisseri	No. These animals will not be harmful because there is only 'structural damage' and accumulation of lipids and lipofuscin. Health will be affected where prolonged exposure to the heavy metals resulting in bioaccumulation.
Dr. K.C.George	Have you worked on histochemistry regarding enzymes?
Dr. Mary K. Manisseri	No.
Shri. Daniel Selvaraj	Why the 'Net Growth Efficiency" (NGE-%) is higher than "Gross Growth Efficiency"? (GGE)

Dr. Mary K. Manisseri	NGE is the growth per unit food assimilated and GGE is the growth per unit food consumed.
Shri Mohammed Koya (M.F.Sc.)	What you mean by Biphasic value?
Dr. Mary K. Manisseri	In general an organism's response to a toxicant increases as the concentration of the heavy metal in the medium increases. But in this case is. when shrimp is exposed to Cu, the shrimp showed higher response (accumulation of unsaturated neutral lipid and lipofuscin) in lower concentration.
Dr. Paul Raj	Added that – infact Cu at very low levels act as a immunostimulant.
Shri. Mohammed Koya (M.F.Sc)	Is "ageing" a stress?
Dr. K.C. George	Answered that oxidation of lipoproteins increases with the age.
Shri G.S.Daniel Selvaraj	Effect of starvation causing structural damage to cells – whether it can come to normal with feeding?
Dr. Mary K.Manisseri	Such an animal can recover with the resumption of feeding only in cases where the 'structural damage' is not beyond the 'point-of-no return".
Dr.K.C.George	What was the methodology followed in the experiment?
Dr.Mary K.Manisseri	Schmol reaction method was adopted for the experiment.
Shri G.S.Daniel Selvaraj	How many days animals can withstand without feeding?
Dr.Mary K.Manisseri	14-20 days
Dr.P.Jayasankar	Maximum days animals were exposed to toxic condition?
Dr.Mary K.Manisseri	15 days
Dr.P. Jayasankar	Value for LC_{50} for Cu?
Dr. Mary K.Manisseri	Juvenile *M. dobsoni* (25-35 mm Total elngth) it is 0.84 mg cu/l. in 96 hours.

Researchable issue

Further studies may be conducted on the effect of stress at the subcellular levels.

Kochi-14
21.9.2002

(Dr. Josileen Jose)
Scientist (SS) & Rapporteur

SEMINAR BY DR R. PAUL RAJ, PRINCIPAL SCIENTIST AND HEAD OF PNP DIVISION, CMFRI, KOCHI

Topic: "Perspectives in Marine Biotechnology"
25th October 2002, 15:15-16:30
Room No. 303

PRESENTATION

The Convention on Biological Diversity (CBD) defines biotechnology as:
"Any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use".
In a broad sense, the definition of biotechnology covers many of the tools and techniques that are commonplace in agriculture and food production. In a narrow sense, biotechnology considers only the new DNA techniques, molecular biology and reproductive technological applications. It covers a range of different technologies such as gene manipulation and gene transfer, DNA typing and cloning of plants and animals.

Biotechnology provides powerful tools for the sustainable development of agriculture, fisheries and forestry, as well as the food industry. When appropriately integrated with other technologies for the production of food, agricultural products and services, biotechnology can be of significant assistance in meeting the needs of an expanding and increasingly urbanized population in the next millennium.

General applications of biotechnology include:

1. Augment seafood production
2. Safeguard human health
3. Protect and restore aquatic environment
4. Reduce fouling and corrosion
5. Exploit marine natural products for human benefit
6. Clarifying fish and shellfish species status

Applications of Biotechnology in aquaculture include:

1. Growth promotion by gene manipulation and hormonal intervention
2. Induction of Maturation & Spawning
3. Sex control by Gynogenesis and Androgenesis
4. Sex reversal
5. Disease management through Vaccines and Probiotics
6. Molecular and Immunology based diagnostic kits
7. Cell and Tissue Culture
8. Aqua Feed Production, including bioencapsulation of live feed, nutrient enrichment of raw materials, fermentation, reducing antinutrients and crude fibre, production of enzymes, Production of carotenoids and Production of Essential Fatty Acids.
9. Micro algae
10. Bioremediation

Biotechnology also finds useful in identification of distinct stocks of fish and shellfish species and the degree to which they inter-mix, ratification of taxonomic status of fish and shellfish.

Environmental biotechnology is an emerging field and the following are relevant areas:

- Bioconversion for waste management
- Microbes in controlling pollution

Bioactive compounds include enzymes, industrial surfactants, biodegradable polymers and pharmacologically active compounds. Novel biomolecules include prostaglandins, Essential Fatty Acids, Carotenoids and Chitosan.

Environmental safety concerns raised by commercial production of transgenic fish or shellfish must be considered on a case-by-case basis, focusing on the species, culture system, and ecosystem at issue in a given application. The prospect of marketing products from transgenic fish and shellfish raises the issue of their food safety. The potential allergenicity of transgene needs careful consideration. Since most transgenic fish lines express an introduced growth hormone gene, consideration of this gene product is particularly important

In conclusion, marine biotechnology is just beginning to revolutionize our ability to better use marine resources. We can expect in the future to see advances in such areas as bioconversion, biomaterials, pharmaceuticals and diagnostics, aquaculture and seafood safety, bioremediation, and biofilms and corrosion.

Discussion

Dr Ramachandran: What are the biotechnological priorities of our institute, considering especially the backwardness vis-à-vis the developed nations?
Dr R Paul Raj: Disease management, molecular taxonomy and bio fermentation.
Dr Velayudhan: Diseases in cultured stock – how competent we are to tackle the issue? What about antibiotics?
Dr R Paul Raj: We are capable of testing for virus. Once inside the culture system, we have little control over the stock. We do not recommend application of antibiotics.
Dr Daniel Selvaraj: Application of hormones and steroids – how are they recommended?
Dr R Paul Raj: For fish growth application of steroids is not recommended, but for genetic manipulation, there is no harm.

26/10/2002

(P. Jayasankar)
Senior Scientist

Kochi
26th October 2002

PROSPECTS OF TUNA FISHERY IN INDIA

SEMINAR BY DR.N.G.K.PILLAI, HoD, PFD
Date: 22.11.2002, Time 1515, Room No.301

RAPPORTEUR : DR.A.A.JAYAPRAKASH, PRINCIPAL SCIENTIST

Dr.N.G.K.Pillai, with the aids of beautiful slides, drew a vivid picture of the present scenario of tuna fishery in the world. He dwelt in detail various aspects like the present trends in exploitation the world over, the culture potential and prospects of tuna fishery in India.

Tunas constitute a fascinating group among the pelagic resources of the world. They occur in all the oceans and are cosmopolitan in habit. They are fast swimmers, have no country barrier and undertake long distant migration. They are called the chicken of the sea. There are the coastal tunas and the oceanic tunas. The former group mostly constitutes a group of small tunas and has characteristic red meat. The oceanic forms mostly grow to large sizes and are the real chickens with white meat.

The tuna fishery the world over is billion Dollar industry. Altogether there are about 49 species the world over. The global production recently touched 3.5 million tonnes mark and the contribution from the Indian Ocean accounted for o.736 m.n. t. The production from the Pacific, Atlantic and Indian oceans were 67%, 12.9% and 19.2% respectively. The important species contributing the fishery were Skipjack tuna (50%), yellowfin tuna (32%), bigeye tuna (10%) and Albacore tuna (6%). Major countries exploiting tunas in the Indian Ocean are Japan, Taiwan, Indonesia, South Korea, Spain and France. Major importers are USA 20%, UK 18.6% and France 17.8%. Major exporters are Thailand 31.7%, Philippines 8.7%, Spain 8.5% and Ivory Coast 8%. In Japan, the *Sashimi* market accounts for 75% of the world fresh tuna trade in terms of value. It is envying to note that some of the countries like Indonesia have made spectacular strides in exploitation of tunas. The production in this country rose from 2.2 lakh tonnes in 1990 to 4.45 lakh tonnes in 2001. However, Spain has overtaken in fresh tuna exports mostly due to rapid expansion of their fishing industry. World frozen tuna accounted for 1.6 m.n.t and was worth 750 m.n. US$. World production of canned tuna was 0.7 m.n. t in 1998 and was worth 22 m.n.US$.

Presetly about 60,000 t of tunas are exploited from the seas around India. Comparing a vast area of EEZ bestowed on us the present exploitation is only meager. In our country, there is no target fishing for tunas. We mostly exploit the coastal tunas in and around the peninsula. The pole and line fishing though target the SKJ, is mostly

confined to the vicinity of the Lakshadweep seas. The small tunas exploited in India are *Euthynnus affinis* (51%), *A.thazard (20), A.rochei (2%), K.pelamis (11%), Thunnus tonggol (10%), Sarda orientalis (1%).* The expansion of fishing operation in recent years to deeper fishing ground are now-a-days yielding good quantity of smaller size yellowfin tunas. Mainly the drift gillnets, Hooks and lines and purse seines are employed to exploit the coastal tunas along the mainland coast compared to pole and line and trolling in Lakshadweep area.

Among the maritime states Kerala is the highest producer (36%) followed by Gularat (18.1%), T.Nadu (11.6%), Maharashtra (5.9%), Karnataka (5%), A.Pradesh (4.4%) and Goa (2%). Gear-wise the drift/gillnets account for nearly 61% of the total tuna catch followed by H&L (16%), pole and line 15%, purseseine 6% and troll line 2%.

The potential for tunas in Indian EEZ has been revalidated as 2,5 lakh tonnes. The scenario of the tuna fishery in Indian EEZ shows that the exploitation is still limited to the small scale sector with little inputs from the industrial sector. The potential of oceanic species like SKJ,YFT and BET remain under exploited. The results obtained till date from the surveys carried out by the Government of India long liners (FSI: *M.F.V.Matsya-sugandhi* and *M.F.V.Matsyaharini* and CIFNET vessel *M.V.Prashikshani*) in the EEZ and beyond the traditional fishing grounds, the industrial long line operations of foreign fleets, the rapid increasing rate of SKJ and YFT in the traditional sector in the country and that of the neighboring insular states such as Maldives and Sri Lanka and the fast pace of growth, expansion and production in the tuna purse seine fishery of foreign fleets from France, Spain, Panama and Ivory Coast in the tropical western Indian Ocean area – all these have indicated tuna resource availability and rich tuna fishing grounds in our EEZ and contiguous seas. Deep-sea fishing is capital intensive and there are few industrialists to plunge into this venture. Those who made have packed off mid-way. The chartered and joint venture programmes initiated by the Government of India came to a close by 1996. Presently illegal fishing, as in earlier days, by foreign vessels is common. Presently EMPEDA in collaboration with AIFI is engaged in upgradation of existing deep sea fishing vessels for long lining. India exported 322 t (Rs.1.06 crores) of frozen SKJ and 834 t (Rs.2.93 crores) of YFT recently.

Nearly 30 Taiwanese vessels, on an average, are found poaching in our EEZ. Taiwan has 308 long liners, Japan 180 and Korea 50. The purseseining in the western Indian Ocean was started in 1982-83. During 1994, 54 vessels (+1000 GRT) belonging to Spain (18), France (17) and Russia, Brazil, Panama, Mauritius and Japan were operating around Seychelles – 10°S and 5° N. The catches amounted to 278,000 t (1992) and currently 360,000t are netted. Yellowfin 49%, SKJ 46%, BET 5% contributed to the catch. Most of the catch is canned. The av.c/e was 13 t in 1984 , which increased to 22 t in 1992. Pole and line, Gillnetting, H&L, Long lining, Purseseining and Trolling are methods used to exploit tunas in the Indian Ocean. Use of large sized gillnets which acts as curtains of death has been banned.

As a step towards development of tuna fishery in the Indian Ocean the Indo-Pacific Tuna development Programme (IPTP, base at Sri Lanka) was launched in 1982-83. Later the IOTC (Indian Ocean Tuna Commission) with a membership of 20 countries was established in 1996.

Mariculture of tunas has hogged the limelight recently. The Kinki University, Nakayama in Japan has made a breakthrough in culturing of southern bluefin tuna. The species grows to over 3 meters and weigh nearly 550 kg. Tuna farming is carried out in pens in the open sea.. The juveniles stocked are collected from the wild. Scientists at Achotines lab have been successful in spawning the southern blue fin tuna and rearing the larvae. This should be an eye opener for us to follow.

Questionnaire Session

Dr.Paul Raj: Are there any mechanisms evolved to the resources.

Dr.N.G.K. Presently we are exploiting only about 60,000 t against a potential of 2.5 lakh tonnes in our EEZ

Dr.M.Rajagopal: What is the trend of tuna catch in Lakshsdweep? Whether the catch is showing increase over the years.

Dr.N.G.K. The data on tuna production from the Lakshadweep Administration is forth Coming. However, the data sets have been sent to us for our comments and to point out the reasons for the fluctuations in tuna production. A preliminary analysis indicated that the catches were on the higher side during times of *El Nino.*

SHRI SIVADAS: who has put in years research experience on tunas in Minicoy clarified that the tuna production depends on the flotsam. The higher the incidence of the flotsam especially during October-November, better the catches are. He pointed out that fishermen especially from Sri Lanka are illegally fishing in the Lakshadweep seas.

Dr.N.G.K. The Institute is planning to install two flotsam in the area. The project is funded by DOD. Also DOD has sanctioned a project on tagging of tunas in Lakshadweep Seas, to study their migration pattern.

Dr.Paul Raj: What about the occurrence of yellowfin tunas in the coastal seas?

Dr.N.G.K.: We are monitoring this aspect.

Dr. Paul Raj: Whether there is any quota system and will not pertain to under UNCLOS that any country can fish in our EEZ if we are not developing our own capability?

Dr.N.G.K: We don't have a correct picture of migration of tunas in our EEZ. The FSI and CFNET vessels have indicated the rich potential. However they have not worked out the economics. If alien tuna fleet can profitably do tuna fishing why can't we?

Dr. (Mrs.) Emelda: Regarding mariculture of tunas what type of culture practice is advisable?

DR. N.G.K: Japanese are culturing tunas by keeping the young ones in pens in the open Sea.

Since there was no more questions the session came to a close. Dr. Noble expressed his thanks to every body.

Kochi
27.11.2002

(A.A.JAYAPRAKASH)

FEM Division Seminar of CMFRI

17.01.2003 1515 hrs.

Topic "Studies on the Euphausiids of the west coast of India"

Presented by Dr. K.J. Mathew, Emeritus Scientist

The Scientist-in-Charge of Seminar Sri G.S. Daniel Selvaraj, Principal Scientist welcomed the gathering and invited Dr. K.J. Mathew, Emeritus Scientist to present the key points of his forthcoming book on **"Euphausiids of the West Coast of India".**

Dr. Mathew in his introductory remarks briefly outlined the history of zooplankton work in India, especially on Euphausiids. Way back in the early 1960s Dr. E.G. Silas, former Director of CMFRI, initiated the investigations on zooplankton in CMFRI. Study on Euphausiids was taken up by Dr. Mathew during the 1960s. Prior to this period the samples could be collected only upto 30 m depth zone. The euphausiids are usually caught from a depth zone beyond 30 m. Hence an ocean going vessel was a necessity to study this group further. Vessel bound marine research acquired greater significance during the IIOE in the 1960-1963 period during which a good deal of information were generated on various known and unknown scientific aspects of the least explored Indian Ocean and its adjacent seas. R.V. Varuna, a 105' multidisciplinary vessel undertook ocean-going research in the Arabian Sea and the Bay of Bengal and it contributed to a lot of scientific data on resources and environment. The Research Vessels *Gaveshni* and *Sagar Kanya* too played their roles towards marine research. Later the well equipped and multidisciplinary sophisticated research vessel *FORV Sagar Sampada* was commissioned in 1985 to undertake planned cruises of marine research in the Indian Ocean especially in the shelf and oceanic waters of the Indian EEZ. Two workshops were conducted on the scientific results of the cruises of *FORV Sagar Sampada* and the proceedings were published giving importance to the fishery resources and the physical and chemical features of the fishery environment in an exhaustive manner. Valuable data was generated and disseminated on primary production, secondary production and fishery resources from the Indian EEZ and the oceanic islands. Investigations on zooplankton population of the EEZ were a significant part of the *Sagar Sampada* cruises. Groups and larval forms were sorted by engaging personnel. Some of

the sorted zooplankton components were sent to different Universities and National Institutes to be studied by experts. The rest were analysed and papers were published in CMFRI. Dr. Mathew gratefully acknowledged the tremendous efforts, help and co-operation extended by his colleagues Mrs. T.S. Naomi and Dr. Geetha Antony in analysing and documenting the zooplankton data. Dr. Mathew could not find time to analyse the group-euphausiids during his tenure as Scientist in CMFRI because there were various other official engagements waiting to be completed in time. He could realise the long cherished dream only after retirement and getting the post of Emeritus Scientist in CMFRI. A part of the Euphausiid collection pertaining to the west coast of India was completed successfully and the results are brought out in the form of a book entitled "Euphausiids of the west coast of India".

The euphausiids are holoplankters with photophores, very sensitive to changes in salinity and dissolved oxygen and the largest among them is *Euphausia superba*. These animals enjoy wider distribution in the world over and the first qualitative studies in the Indian Ocean were conducted by G.O. Sars in 1883. A comprehensive account was then presented by Dr. Mathew on the distribution, abundance and variations of biomass and constituent common species of euphausiids of the west coast of India in space and time such as shelf and oceanic regions, different depth zones, latitudinal sectors, premonsoon, monsoon and postmonsoon season and monthly fluctuations supported by vivid charts and Tables. The research findings can be summarised as follows under different headings.

1. Sampling locations and Day-night variations: Maps depicting the above parameters of the euphausiids in the Arabian Sea were shown.
2. Special characteristics of the environment:

The environmental characteristics of the Arabian Sea were described in detail by showing the circulation pattern and its monthly changes to stress the profound impact it has on the faunal variations through space and time. How the land locked northern end of the Indian Ocean and the climatic conditions influencing the circulation patterns during the SW and NE monsoons; formation of water masses in different depth zones and the accompanying changes in temperature, salinity and dissolved oxygen; reversal of surface currents; occurrence of upwelling with the onset of SW monsoon and its slow

progress from south to north bringing in nutrient rich water to the euphotic zone and the thermocline barrier affecting the water movement restricting the dispersal of the component species in the water column were amply described by Dr. Mathew. The effects of environment were studied in relation to the abundance and distribution of euphausiids.

3. Monthly distribution: The month-wise distribution in the four latitudinal sectors namely, 0.5°N, 5°N-10°N, 10°N-15°N, 15°N-22°N indicated their concentration more towards southern regions.
4. Distribution of euphausiids in space: Species-wise distribution of the euphausiids in the shelf and oceanic realms of the eastern Arabian Sea are as follows:
    a. *Thysanopoda monocantha*: Mesopelagic oceanic species confined to the southern region only and not observed in the nearshore waters. Adults occur upto 15°N in the deeper areas. Larvae and juveniles are present often in the collections.
    b. *T. tricuspidata* : Found in the oceanic regions up to 15°N. Larvae occur in the shelf waters.
    c. *Pseudeuphausia latifrons*: Neretic species, cosmopolitan, usual inhabitant around oceanic islands also. Observed on the border areas of EEZ.
    d. *Euphausia diomedeae*: Second most abundant species, reside in the sub-surface layers, concentrates more to the southern parts.
    e. *E.sibogae*: Top-most abundant species, epipelagic, cosmopolitan, indicator of water masses and occurring more in the shelf waters.
    f. *E. tenera*: Oceanic species, small and rare in occurrence, observed up to 12°N, found in Wadge Bank and around oceanic islands.
    g. *Nematoscelis gracilis*: A species of wider distribution, more towards the southern regions.
    h. *Nematobrachion flexipes*: Only in the southern areas but not towards the shelf waters, rare occurrence.
    i. *Stylocheiron armatum*: Occurred through out the area of investigation.
    j. *Stylocheiron affine*: Occurred through out the area of study.

k. *Stylocheiron longicorne*: Not very abundant, patchy and less dense in occurrence.

l. *Thysanopoda astylata*: Deep water species, never found beyond 13°N latitude.

Minor species: *Stylocheiron suhmii*

S. microphthalma

S. abbreviatum

S. maximum

5. Distribution in time:

   E. sibogae and *E. diomedeae* constituted more than 60% in abundance. *E. sibogae* and *P. latifrons* showed preponderance during the monsoon and postmonsoon seasons, while *S. armatum* and *S. affine* during the premonsoon months.

6. Depth-wise variations: Highlighted the distribution of the component species in the depth zones of 0-50m, 51-100m, 101-200m, 200-1000 m and >1000m.
7. Shelf and oceanic variations: Almost equally distributed in the two environments.
8. Latitudinal variations: 0-5°N, 5°N-10°N, 10°N-15°N, 15°N-20°N and >20°N: All species showed abundance in the southern latitudes.
9. Day-Night variations: The adults undertake long migrations while the juveniles less and the larvae almost nil. Species of long migrations and short migrations were given prominence.
10. Seasonal variations in latitudinal sectors
11. Monthly variations in latitudinal sectors
12. Seasonal variations in the shelf and oceanic regions
13. Monthly variations in the shelf and oceanic regions
14. Breeding periodicity: Six species were selected for this study giving emphasis to egg bearing females, spermatophore bearing males, sphermatophore bearing females, larvae and juveniles. Peak periods are shown as high, moderate, least and none.

15. **BIODIVERSITY OF THE EUPHAUSIIDS:** This study was conducted using the software **PRIMER.** Dr. P.K. Krishnakumar, one of the co-authors of the book presented the findings. Statistical analyses were done making use of the methods Univariate, Multivariate and Clusterity. Margaleff's Diversity Index, Pielou's Evenness and Shannon's Evenness were calculated. Values of Similarity Indexes were worked out – clustering in season similarity, latitude similarity and depth similarity, variations with latitudes and monsoon. It was found that there was a premonsoon high and monsoon low for the biomass of euphausiids. A new method, **Taxonomic Distinctness (TD)** by Clarke and Warwick 2001 was applied to study the species-wise variations in the shelf, oceanic and latitudinal sectors and for comparisons. The species components showed a propensity to be more denser towards deeper areas and lesser in number as we proceed from south to northern latitudes.

INTERACTION WITH PARTICIPANTS:

1. **Dr. N.G.K. Pillai, Director-in-Charge:**

Just now we heard a very informative talk on the euphausiids of the west coast of India. Detailed analyses of the data were carried out on euphausiids as a whole and the constituent species collected during the cruises of *FORV Sagar Sampada* from different depth zones, latitudinal sectors and in monsoon seasons. I just wonder whether any year to year variations of euphausiids or the component species were studied in relation to fish production so that we could work out indices of fish production.

Dr. K.J. Mathew: I could not find time to attend to those aspects and to work out fish production indices in relation to yearly variations of euphausiids. No such study was undertaken during the tenure of the Project.

2. Dr. M. Rajagopalan, Head, FEMD

Dr. Mathew had done really a wonderful job. Even after his retirement he could pursue his interest on the study of euphausiids and bring out a book on it within a short span of time of just 2 years. It is something which most people do not attempt after retirement and he deserves all our appreciation.

You were sticking on to euphausiids for a period of nearly 40 years. Starting from *R.V. Varuna* collections up to now have you noticed any change with regard to the

species composition, taxonomy and its abundance in relation to distribution between areas? Further, have you any suggestion as to what is going to happen to euphausiids in terms of biomass or species? We are going to have a very useful multidisciplinary project on Global Warming. If you have any suggestion please give.

Dr. Mathew: There is no comparison as such to give on euphausiids. I have worked on certain geographical areas within the shelf and a little beyond the shelf areas. The collection depth was from surface to 150 m depth. There is no comparison with my earlier work carried out between Karwar and Cape Comorin on the west coast in the case of euphausiids as a whole. There was not much of a change with regard to the total euphausiid biomass or species. It is a healthy environment with self-sustaining good biota so beautiful when viewed from different angles. There may be some minor changes here and there. Moreover, the data on abundance, distribution and variations of species of 1960s are comparable to those of the 1980s.

3. **Dr. M. Rajagopalan, Head, FEMD**

Are there any clues as to why these minor changes do occur?

Dr. Mathew: The whole environment as an entity did not show any change with regard to total euphausiid biomass but there might have been some minor changes in species abundance in some areas.

4. **Dr. Jayasankar:** Whether the fish show any liking towards euphausiids as food?

Dr. Mathew: Yes, fishes do prefer euphausiids.

5. **Dr. G.S. Daniel Selvaraj :** There is change of water mass between northern latitude and southern latitude and the current is also changing. How can there be latitudinal difference showing two clusters of euphausiid population in this environment with reference to SW and NE monsoons along the west coast of India?

Dr. M. Srinath: There are 2 species which constitute more than 60%. Hence there are 2 distinct clusters.

Dr. P.K. Krishnakumar: First we calculate Biodiversity index. Based on that clustering is done later.

Dr. M. Srinath: Clustering is directly and indirectly related to biomass. So clustering towards south is biased. Remove the 2 dominant species and check with other species and see how this clustering takes place in the south.

Dr. P.K. Krishnakumar: We have to remember that first we calculate Biodiversity index. Clustering is worked out subsequently.

Dr. M. Srinath: Anyway the clustering in euphausiids in the southern areas is biased. Remove the 2 species as 2 distinct populations first and see what happens. There is a new approach now. It is a **2-way indicator analysis** with regard to stations, latitudes etc. It has not been developed in Windows. This 2-way indicator analysis is very helpful in statistical analyses.

Towards the concluding part of the Seminar Dr. Mathew thanked warmly the Heads of Division, Dr. M. Rajagopalan, FEMD and Dr. M. srinath, FRAD for helping him to carry out the work successfully. He was immensely grateful to Dr. N.G.K. Pillai, Director-in-Charge, Dr. Somy Kuriakose, Dr. P.K. Krishnakumar, Dr. Balan, Dr. T.V. Satyanandan, Dr. G.S. Daniel Selvaraj, Research Scholars Ms. Gisha and Ms. Fabeena. Ms Gisha analysed, identified and enumerated the species and also did the Herculean task of computer analysis and presentation. He was also thankful to Dr. V. Chandrika for giving moral strength.

Then Dr. N.G.K. Pillai, Director-in-Charge stated that for the first time in CMFRI an Emeritus Scientist gave a seminar on the successful completion of the project within the stipulated period of 2 years. Dr. Mathew had even submitted the results of the Project in a book form to the Director 2 weeks ahead of the seminar. CMFRI is grateful to him today for the detailed and informative presentation on the euphausiids of the west coast of India. Dr. Mathew deserves all our appreciation and congratulations for the work he had completed. Director-in-Charge expressed the hope that Dr. Mathew would come back and finish the work pending on the Bay of Bengal.

Sri G.S. Daniel Selvaraj, Scientist-in-Charge of Seminar thanked all those who were present for the seminar. He too expressed the wish that Dr. Mathew would come back to finish the work on the east coast. He was extremely grateful to Dr. N.G.K. Pillai, Director-in-Charge, Dr. M. Rajagopalan, Head, FEMD, Dr. P.K. Krishnakumar, the rapporteur Mrs T.S. Naomi, Ms Gisha one of the best scholars for putting in hard work and Ms. Fabeena, the newly appointed scholar to work on euphauiids. He thanked Dr. Mathew for presenting the work and for offering the high tea for everyone. The seminar came to a close at 1700 hrs.

(T S Naomi)

SEMINAR BY Dr. Josileen Jose ; CFD CMFRI, COCHIN

TOPIC: Seed production of the Blue Swimmer Crab *Portunus Pelagicus*

27-2-2003, 1515-1630,ROOM NO.301

Topic was introduced by Dr. D. Noble

PRESENTATION

The seminar gave a complete picture of the fishery, biology, culture prospects and export demands of the marine crab *Portunus pelagicus*. In the introductory part its geographical distribution, status of fishery in India, its culture potential with respect to the declining fishery and the disease out breaks in shrimp farms were discussed.

Biology of flower crab/ sand crab (*P.pelagicus*) was explained in detail showing pictures of male and female crabs and each stages in larval development. It is a continuous breeder and spawning occurs during night times. Fecundity of the wild spawner range from 60,000 to 19 lakhs while in captive maturation it is noticed to range from 60,000 to 13.5 lakhs. Egg incubation is 9 –10 days and the colour changes from yellow to dark grey and was substantiated with photographs. A simple design for the crab hatchery was explained with details of the seawater holding and storage tanks, brood stock holding tank, hatching tank, larval rearing tank, live feed culture tanks, nursery tanks etc. Different aspects of hatchery operations were detailed stepwise ie, collection and transportation of berried crabs, hatching, larval rearing, nursery rearing etc. Results of the experiments conducted on feeding and settling materials were briefed. The problems related to crab seed production were discussed in detail. Mortalities during different larval stages, the differential growth rate and cannibalism were pointed out as the major constraints.

Discussion

Dr P Jayasankar: whether the differential growth observed in baby crabs is sex related?
Dr Josileen Jose: No, both sexes exhibit differential growth. Until they attain 35 mm carapace width we cannot distinguish the sex, without sacrificing the animal.

Dr P Jayasankar: After a certain period of growth whether growth will be uniform?
Dr Josileen Jose: No, shows differential growth continues.

Dr E V Radhakrishnan: Have you noticed if the small crabs are females and big ones are males?
Dr Josileen Jose: Upto maturity both the sexes have almost similar growth rate, afterwards females show prolonged intermoult periods.

Dr P Jayasankar: So is their any chance for monosex culture?
Dr Josileen Jose: upto a size of 35mm carapace width it is difficult to determine the sexes externally, hence monosex culture is difficult at that stage. And about using hormones or other genetic engineering methods further research

is required.

Dr Imelda Joseph: At what size pond stocking is being done?
Dr Josileen Jose: usually it is 10mm carapace width size.

Dr Imelda Joseph: How long it takes to reach that size?
Dr Josileen Jose: Approximately 2 weeks.

Anand,PhD: How the live berried crabs are being transported?
Dr Josileen Jose: they are transported in good quality sea water with out air exposure. Incase of long distance transportation additional aeration is given.

Mohammad koya, MFSc: how long it takes to extrude out the eggs?
Dr Josileen Jose: it takes ½ hr-1hr depending on the size of the mother crab.

Dr A A Jayaprakash: How can we prevent cannibalism?
Dr Josileen Jose: The cannibalism starts with the last larval stage megalopa, with proper feeding and providing a suitable substratum we can limit the cannibalism. Since they have a clinging habit experiments were conducted with different settling materials like seaweeds, sea grass, net materials, pieces of corrugated asbestos sheets, edible oyster shells, coral stones, old tyres etc of these sea grass *Cymodocea* is found to be the best.

Dr A A Jayaprakash: what about the use of some intoxicants/tranquilizers like tobacco leaves?
Dr Josileen Jose: water quality is given prime importance, hence not suitable.

Dr Reeta Jayasankar: In how many days marketable size is reached ?
Dr Josileen Jose: In grow out ponds it takes 4 months to reach the marketable size.

Dr Imelda Joseph: Details of feeding in farms?
Dr Josileen Jose: in the nursery phase crabs are fed with egg custard for the first week, second week clam/shrimp meal and afterwards with clam meat/ shrimp head waste/prawn meat/trash fish/or the other cheaply available fish/ shell fishes depending on the availability.

Dr Imelda Joseph: what is the stocking rate?
Dr Josileen Jose: 100nos/m^2

Dr Imelda Joseph: whether we need to cull out as the culture proceeds
Dr Josileen Jose: Need not, they will cull themselves out as they have the cannibalistic behaviour.

Dr Imelda Joseph: what is the survival rate?
Dr Josileen Jose: 50-70%

Dr Reeta Jayasankar: Have you got the complete life cycle?
Dr Josileen Jose: Yes, up to F_4 generation we have produced in the hatchery.

Dr Reeta Jayasankar: Have you succeeded in captive maturation?
Dr Josileen Jose: Yes, but it is always better to have wild berried ones in the case of *P.pelagicus*.

Dr Reeta Jayasankar: But in the hatchery operations isn't it better to have the captive broodstock?
Dr Josileen Jose: Since it is a continuous breeder mother crabs are available throughout the year. So it's better to avoid the broodstock management to minimise the cost and labour. It is found that fecundity is less compared to same sized wild ones.

Dr Imelda Joseph: Is it a purely marine species?
Dr Josileen Jose: yes

Dr Imelda Joseph: what salinity it is obtained from?
Dr Josileen Jose: Main fishery is from seas (30-35%°) but seasonal fishery exists in the brackish waters also (15-25%°). Hence it can survive wide range of salinities

Dr Imelda Joseph: noticed below that?
Dr Josileen Jose: In Chilka lake it is reported even at 0%°

Dr D Noble: Any diseases encountered in larval rearing?
Dr Josileen Jose: Once lagenidium infection was observed at zoea II stage in one of the rearing tanks and sacculina infection is found in the wild ones.

Dr Ashalatha: what is the larval survival rate?
Dr Josileen Jose: maximum survival rate observed is 20%. Assured survival is 10%, even 0% survival was observed at times. Maximum mortality is zoeal-zoealI followed by zoealV-megalopa and megalopa to crab.

The seminar was summarized by Dr E V Radhakrishnan, head CFD by pointing out the importance of crab in the foreign trade and the need for research to focus further on an economically viable hatchery technology as the hatchery operation has been standardized the need to evolve it into an economically viable enterprise.

Kochi
27-2-03

(Liya Ambipillai)
SRF,CFD
Rapproteur

SEMINAR BY SMT.SHEELA IMMANUEL, SEETTD, CMFRI, KOCHI-14

TOPIC: ATIC- AN OVERVIEW
28.03.03, 1515-1630 HRS, ROOM NO.301

PRESENTATION

ATIC was sanctioned to C.M.F.R.I during the year 1999, with the following objectives

i) to provide a single window delivery system for the products and services available from the institution to the farmers and other interested groups as a process of innovativeness in Technology Dissemination at the institute level.

ii) to facilitate direct access to the farmers to the institutional resources available in terms of technological advice and products for reducing technology dissemination losses; and

iii) to provide a mechanism for feedback from the users to the institute

The organisational structure and functional components of ATIC were also explained. A brief report of the ATIC including sales of products and services was presented. The report was based on the activities done during the past two years. Suggestions were invited from the participants for further improvement of the activities of ATIC.

DISCUSSION

Dr. P.C. Thomas: Whether the income generated from ATIC will go to NATP or it could be recirculated within the institute?

Smt. Sheela Immanuel: The procedure has to be streamlined. There is an allocation of Rs. 5 lakhs as operational expenditure for ATIC which will be utilised for publication of leaflets and pamphlets. 10 percent margin will come to ATIC as revolving fund.

Dr. Reeta Jayasankar: Whether the 10 percent margin will go to other divisions for technology generation?

Smt. Sheela Immanuel: No. At present there is no provision for payment for the services rendered by other divisions.

Mr. Mohammed Koya: Whether ATIC will be started in substations of the institute considering the need for Technology Dissemination in other regions especially in Lakshadeep?

Smt. Sheela Immanuel: As per the guidelines of NATP, ATIC is supposed to function only in the Head Quarters.

Shri.G.S. Daniel Selvaraj: Whether the name of Agricultural Technology Information Centre will be changed to Fisheries Technology Information Centre?

Smt. Sheela Immanuel: The question has already been raised in the annual meeting, but not yet approved.

Dr. R Sathiadhas, Head, SEETTD concluded the session with further clarification of the queries raised in the session and future perspectives of ATIC. He also appreciated Smt. Sheela Immanuel for the nice presentation.

The Session was closed by 16.15 hrs with the vote of thanks by Dr.G.S. Daniel Selvaraj. He has congratulated Smt. Sheela Immanuel for her nice presentation and thanked all the participants of the seminar.

Kochi
2.04.03

(Aswathy.N) (Rapporteur)
(Scientist, SEETTD)

SEMINAR BY SHRI T. S. VELAYUDHAN,

Principal Scientist, MFD, CMFRI, Kochi – 14 on 11-04-2003

TOPIC – Marine Bio-fouling and Control Measures

Date: 11-04-2003 **Time: 15.15 – 16.30** **Venue: Room No. 201**

PRESENTATION

Bio-fouling is defined as the settlement and growth of certain plants and animals on man-made substrata in the sea. Major problems encountered due fouling are:

- Propulsion of boats and ships – frictional resistance, speed loss, increased fuel consumption
- US$ 500 million expended for maintenance in US
- India Rs. 300 million for small boats
- In India oyster wooden farm structure 50%/y
- Metal Iron floats and cages replacement 100% /y
- Generation of debris 8-9 kg.m-2.y-1
- A 3,25,000 tanker has 25,000 m2 area
- Sonic devices of ships and coastal defense – transmitted energy found several times reduced when reflected
- Sound beam pattern of projector beam considerably distorted

There is more than 4000 species of microscopic and macroscopic animals and plants in the fouling community. Microscopic forms include bacteria, diatoms, protozoa, rotifers and macroscopic forms include weeds, sponges, coelenterates, bryozoans, flat worms, annelids, crustaceans, arthropods, molluscs, echinoderms, pro-chordates.

During bio-fouling certain animals and plants are essential for subsequent attachment of later forms (inter-relationship) is called biotic succession Usually the ecological succession is influenced by temperature, salinity, pollution waves, tides, currents, light, cooler, texture, oxygen and hydrogen sulphide. A primary film containing bacteria, diatoms, algal spores, and organic detritus – formed within hours is essential for the biotic succession which is essential for initial conditioning by polymeric material (light molecular weight glycoprotein), chemical attraction of motile bacteria and secondary microbial population.

The factors affecting fouling are temperature, salinity, pollution, turbidity, waves, tides and currents and other physical factors include light; most of the larvae of the fouling animals are negatively or positively phototropic at settlement, colour; red black and white attract large numbers, blue green and grey attract fewer larvae, texture; rock, concrete, asbestos, earthen tiles etc. attracts the larvae. Chemical factors include oxygen and carbon dioxide; act as critical factors, sewage entry and decay of organic matter will cause depletion of oxygen and the shells remain closed and cease feeding leading to poor growth and ultimate death, phosphate and nitrates helps phytoplankton production and availability of plenty of food.

Control measures in the bivalve farm include; periodic cleaning and scraping, judicious choice of depths for growing, suitable meshes for cages, avoiding spawning seasons or timely treatment against the larvae, avoid colours that attract the larvae, use of shades, weekly beaching, jetting of water, and vertical suspension of frame nets, introducing pieces of old fish net in cages. Biological control (*Tetrodon sp*) for barnacles, include fresh water treatment, Brine solution, Chlorination of treatment water, changing of farm sites, formaldehyde treatment (1%), treatment of farm structures with anti fouling paints containing Tributyl Tin Oxide, Copper Arsenochrome.

RELATIONSHIP BETWEEN BORING & FOULING

If there is heavy fouling it is observed less boring and Vice versa. If sponge fouling is more less fouling of barnacles was observed. Likely if ascidians are more, barnacles fouling will be less. When there is more hydrozoan's fouling there is high silting in them due to the hairy structures of the body.

DISCUSSION

Shri. G. S. Danieal Selvaraj:	Is there any problem in the settlement of spats when antifouling paints are used in the farm structures for preventing of settlement of foulers?
Shri. T. S. Velayudhan:	Yes, the spat settlement will be affected adversely.
Director:	Crabs are not foulers or borers only associates
Shri. T. S. Velayudhan:	Crabs are not borers or foulers and are predators.
Director:	What is the success of communities as short term and long term basis?
Shri. T. S. Velayudhan:	If more ascidians, sponge there will be less barnacle settlement.

Director: Any studies made on the quantitative measurements in relation to attractants?

Shri. T. S. Velayudhan: Yes, Dr. Daniel and others at Madras harbour.

Director: Any research work has done on the settlement and growth has been affected in the culturing animals?

Shri. T. S. Velayudhan: Yes, Tubicular polychaets barnacle, sponge, avicula, etc. affected the growth of spat and adult oysters

Director: Which substrate is ideal for the settlement of pearl oyster spat in the wild?

Shri. T. S. Velayudhan: Nylon rope and happa with velone screen are good materials for the settlement of pearl oysters in the West coast. Quantified the fouling on the cages and growth studies are made.

Director: How you are following the cleaning of farm animals?

Shri. T. S. Velayudhan: We are cleaning the cages fortnightly. Japan, Australia and Indonasia are following forceful jetting of water to structures by giving 6 hr. exposure.

Director: What is the result in using egg white dipping on spat collectors?

Shri. T. S. Velayudhan: First egg-albumin was blended and the spat collectors were dipped and sun dried and used for spat settlement. This attracted more numbers of bacteria and increased the settlement.

Dr. Emelda Joseph: What is the role of algae and positive chemotaxis on the settlement of barnacle on algae.

Shri. T. S. Velayudhan: The primary film like substances that attracts the barnacle larvae to settle in.

The seminar came to a close by 16.30 hrs and Shri. G. S. Daniel Selvaraj thanked Shri T. S. Velayudhan for the nice presentation of the topic. He also thanked the Director and others for attending the seminar and for their interactions.

(Shoji Joseph)
Scientist (Sr. Scale)
Rapporteur

Kochi
23-04-03

SEMINAR BY DR. IMELDA JOSEPH, SCIENTIST, PNPD, CMFRI, COCHIN

Topic : Fermentation Technology for Production of Bio-molecules

9-5-2003; 1515 hrs, Room No.301.

PRESENTATION

Biomolecules are primary or secondary metabolites produced by live organisms. These are produced by bioprocesses, which have two phases viz, fermentation and down stream processing (product recovery). Fermentation is the multiplication of microbes under optimal conditions and production of desired metabolites whereas down stream processing involves expansion and purification of biomolecules thus produced. Fermentation is a multiphase system consisting of a solid phase, which is the biocatalyst i.e., individual microbial cells/immobilized enzymes and a liquid phase which is the nutrient medium.

The seminar dealt in detail various aspects of fermentation process such as important steps involved, kinetics of biological reactions like microbial growth, product formation, microbial and enzyme balance etc. Different types of fermentation processes and different types of biomolecules produced were also dealt in detail. There was also discussions on immobilization of enzymes and its application. Aspects like the potential, factors affecting enzyme production and advantages of solid state fermentation (SSF) were also covered in the seminar.

Discussion

1. **Dr. D. Noble :** Why there was no mention of anaerobic fermentation in the seminar? Most of the classic fermentations such as rumen fermentation in cattle, wine and cheese production etc. are all examples of anaerobic fermentation.

   Dr. Imelda: Yes, it could have been included.

2. **Mr. S.K. Patra** : In solid state fermentation 80% moisture is maintained, how this can be used as feed.

   Dr. Imelda: Can not be used directly as feed. Can be used as ingredient only.

3. **Mr. Anand:** How to regulate the 80% moisture level in SSF?

   Dr. Imelda: By controlling moisture level in the ingredients this can be maintained.

4. **Dr. G.S.Daniel Selvaraj:** Explain primary and secondary metabolites.

   Dr. Imelda: Primary metabolites are formed during exponential phase. Secondary metabolites are formed during stationary phase before death phase. Secondary metabolites are more important for biotechnological applications.

5. **Dr. P.C. Thomas:** Can you suggest some references on fusion genes about which you have mentioned in down steam processing?

   Dr. Imelda: Yes, there are several references available.

6. **Dr. G.S.Daniel Selvaraj:** Explain about the temperature increase due to metabolism.

   Dr. Imelda: Temperature will be generated during exothermic metabolic processes.

7. **Mr. S.K. Patra:** Any work in India in this direction?

   Dr. Imelda: In the National Biotechnology Centre at IVRI, Izatnagar, lot of work is going on.

8. **Dr. G.S.Daniel Selvaraj:** What way this is useful to CMFRI?

   Dr. Imelda: Useful for production of antibiotics, enzymes, feed development etc.

Towards the end of the seminar, Dr. R. Paul Raj, Head, PNP Division gave concluding remarks. He mentioned the importance of fermentation in large scale production of novel biomolecules such as antibiotics, amino acids, essential fatty acids and enzymes. Fermentation process is also used in improving the nutritional quality of large variety of substrates, which are not efficiently utilized by man and animal and making them more digestible and also helps in removal of aninutritional factors.

Kochi
22-5-2003.

Dr. K.S. Sobhana
Scientist (SS)
Rapporteur of the seminar

Sediment and water quality management in mariculture

Seminar by Dr. D.Prema, Scientist Sr.Scale, FEMD., CMFRI., Kochi
Date: 23-5-2003; 15.15 –16.30 hrs; Room No. 301

Presentation: Sediment quality, factors affecting sediment quality, their effects on cultured animals, water quality, their deciding factors and management practices to improve water and sediment quality were presented in the seminar.

1. Sediment Quality

Sediment quality is one of the key factors for the success of aquaculture. The physico-chemical characteristics of pond water are very much influenced by the properties of bottom sediments. The sediment functions as a buffer and governs the storage and release of nutrients into the water. It serves as a biological filter through the adsorption of organic residues of food, excretory products and algal metabolites. The sediment holds high bacterial load which helps in decomposition and mineralization of organic deposits at the bottom. The nature and decomposition of pond sediment have important role on the balance of coastal aquaculture systems and in determining the fertility of culture ponds and consequently on the growth and survival of fishes and other aquatic organisms. The sediment quality of brackish water ponds is periodically likely to be altered by tidal influence and consequent churning processes.

Factors affecting sediment quality and their favorable ranges were presented as follows

Soil texture	Sandy clay loam
Soil color	Blackish brown
PH	6.5 – 7.5
Water retention capacity of soil	40% and above
Sand	40%
Silt	40%
Clay	30%
Available N	250 to 750 ppm
Available P	60 ppm and above
Available K	250 ppm and above
Organic carbon	1.5 – 2.5%
Electrical conductivity	<16 mmhos/cm

2. Water Quality

Water Quality in aquaculture encompasses all physical, chemical and biological variables that affect aquaculture production. The aquatic environment is a complex

dynamic system. It is subject to constant physicochemical changes due to natural causes and man's activities. The slightest deviation from the optimal level may result in stress to the cultured organisms. Stress elicits a series of physiological and behavioral responses in the organisms. If prolonged, the stress may lead to poor growth, reproductive failures besides rendering them susceptible to diseases. Most pond management procedures are aimed at improving the water quality.

Factors affecting the water quality were listed and explained as turbidity, temperature, salinity, water pH, dissolved oxygen, total alkalinity and hardness, BOD and COD, oxidation –reduction potential, ammonia, chlorine, methane, H2S, heavy metals and pesticides.

Certain metals in pond water, their safe levels and sub lethal concentrations were presented as follows

Metal	**96 hr LC 50 (µg/l)**	**Safe level (µg/l)**
Cadmium	80 – 420	10
Chromium	2000 - 20000	100
Copper	300- 1000	25
Lead	1000 - 40000	100
Mercury	10 – 40	0.10
Zinc	1000 - 10000	100

Similarly toxicity of selected chlorinated hydrocarbon insecticides to aquatic life was also presented

Pesticide	**96 hr LC 50 (µg/l)**	**Safe level (µg/l)**
Aldrin/Dieldrin	0.2 to 16	0.003
BHC	0.17 to 240	4.000
Chlordane	5 to 3000	0.010
DDT	0.24 to 2	0.001
Endrin	0.13 to 12	0.004
Heptachlor	0.10 to 230	0.001
Toxaphene	1 to 6	0.005

Water quality parameters, their problem and corrective measures were presented in the course of her seminar presentation.

Management practices such as filtration, coagulation, chlorination, ozonization, oxidation, aeration, lime application, sediment removal or sludge removal and water exchange were also touched upon with examples.

Significance of lime application was explained as

1. Lime creates a buffer system to prevent marked diurnal changes of the water from acidic to alkaline conditions.
2. It neutralizes the soil acidity.
3. It precipitates colloidal matters such as clay suspended in water.

4. It kills pathogens and promotes bacterial breakdown of organic matter.
5. It helps phosphorus fixation in the pond soil.
6. It supplies calcium needed for bone formation in fish and for plankton growth.

Based on the pH of soil and type of lime, the quantity of lime to be applied varies. To raise the pH of soil to 7 and the time of pond preparation, the quantity of lime (tonnes/ha) to be applied are as follows.

Soil pH	$CaCO_3$ (Limestone)	$Ca(OH)_2$ (Slaked lime)	CaO (Quick Lime)
6.1 to 6.5	2.5	1.9	1.4
5.6 to 6.0	5.0	3.7	2.9
5.1 to 5.5	10.0	7.4	5.8
4.6 to 5.0	12.5	9.3	7.2
4.0 to 4.5	15.0	11.1	8.7

For application within the culture period, a rate of 2000 Kg Limestone per hectare was recommended as the general dose.

DISCUSSION

Dr. Sivakamy : Whether the sudden outbreak of diseases in fish and prawn ponds is due to the deterioration in water quality?

Dr.Prema : Yes. Deterioration of sediment and water quality of ponds can cause diseases to the organisms cultured.

Dr. K.C.George : Any extent of deterioration of water quality can cause stress to the animal and can lead to diseases later.

Dr.M.Rajgopalan : Is it possible and successful to culture *P. monodon* in ground water drawn from Arid zones?

Dr.Prema : It is successful to culture *P monodon* in arid zone if certain management practices are adopted to improve the water quality

Dr. Sivakami : Is chlorination toxic to aquariua?

Dr. Prema : Yes, slightest levels of chlorine is toxic, which can be cleared by aeration

Sri.K.Jayasurya : Is there any relation between the nitrogenous compounds and heavy metals in sediment ?

Dr. Prema : During the decomposition of organic matter, nitreogenous compounds are released to the system, during which heavy metals will be added to the sediment.

Sri.K.Jayasurya : In one of the presentations at National seminar on Algae held at Trivandrum, I heard an attempt of prawns and algae cultured together-is it possible?

Dr.Prema : It is possible and tried in CMFRI to culture seaweeds in prawn Farming effluents.

Dr.Kripa : MPEDA with financial support from NACA is adopting prawn

farming in water pumped from bio-ponds growing seaweeds/algae.

Sri. Daniel Selvaraj : For deciding soil fertility, whether organic carbon alone is considered or other parameters also?

Dr.prema : Not only organic carbon content but the levels of available N, P and K also are considered as soil fertility factor.

Dr. Ramachandran : In crop science, quantity of fertilizers are recommended based on a long term basis. However, in aquaculture in general and mariculture in particular no such packages of practices are available. Why is it so?

Dr. Prema : Yes, Banerjea compared 400 freshwater fish farms from West Bengal and suggested std water quality parameters for optimum yield.

Dr.P.Kaladharan : Unlike aquaculture (fresh water) adequate number of case studies on mariculture or saline aquaculture have not been taken up to recommend standard levels of water and sediment quality parameters.

The Division Head, Dr.M.Rajagopalan, Principal Scientist appreciated Dr.D. Prema for the efforts made to gather more valuable details and to make an excellent presentation.

(DR.P.Kaladharan)
Senior Scientist

SEMINAR BY Mrs. MINI, K.G., FRAD, CMFRI, COCHIN

TOPIC: *ARTIFICIAL NEURAL NETWORK AND ITS APPLICATIONS IN FISHERIES*

04-07-2003, 15.15-16.15 HRS.

ROOM NO. 303

PRESENTATION

An Artificial Neural Network (ANN) is an information processing paradigm that is inspired by the way biological nervous systems, such as the brain, process information. The key element of this paradigm is the novel structure of the information processing system. It is composed of a large number of highly interconnected processing elements (neurones) working in unison to solve specific problems. ANNs, like people, learn by example. Learning in biological systems involves adjustments to the synaptic connections that exist between the neurones. This is true of ANNs as well.

The commonest type of ANN consists of three groups, or layers, of units: a layer of ***input*** units is connected to a layer of ***hidden*** units, which is connected to a layer of ***output*** units.

The behaviour of an ANN depends on both the weights and the input-output function (transfer function) that is specified for the units. This function determines the relationship between inputs and outputs of a node and a network and introduces a degree of non-linearity that is valuable for most of the ANN applications. In practice, a small number of bounded, monotically increasing and differentiable activation functions are used.

Every neural network possesses knowledge, which is, contained in the values of the connections weights. Modifying the knowledge stored in the network as a function of experience implies a learning rule for changing the values of the weights.

The process of adjusting the weights and threshold values in a neural net is called training and the most popularly used training method is the back propagation algorithm Weights of a network are iteratively modified to minimize the overall mean or total squared error between the desired and actual output values for all output nodes over all input patterns.

Depending on how the data is processed ANNs are classified as feed forward and feedback networks. Neural networks are very good tools for Prediction, Classification, Data association, Data conceptualization and Data filtering and can be used to solve a variety of real world problems.

A detailed description of a neural network model for forecasting fish stock recruitment was presented. ANNs can be used to improve the accuracy of fishery stock forecasts and hence management of the fishery resources. Detailed description was given on applications of NNs for species identification, prediction of fish community composition, phytoplankton production modeling etc.

ANNs are data driven self adaptive methods and they require a few assumptions about the models. They can be treated as multivariate non-linear non-parametric statistical methods. These properties make them superior to traditional models. But for static, linear processes with little disturbance, they may not be better than linear statistical methods. ANNs are black-box methods and there is no explicit form to explain and analyze the relationship between input and output. This causes difficulty in interpreting results from the networks. Again, ANNs usually require more data and computer time for training.

The computing world has a lot to gain from neural networks. Their ability to learn by example makes them very flexible and powerful.

DISCUSSION

Dr. Sunil Kumar Mohammed: In the example presented on forecasting fish stock recruitment using Neural network you said that the model performed reasonably well, what you mean by "reasonably well"?

Mini, K.G.: This is in comparison with the other models.

Dr. Srinath: Comparisons were made with multiple regression model and Rickers Model. The R^2 between fitted and observed recruitment were 0.29 and 0.42

respectively. The neural network model explained about 60% of the variation in the data.

Dr. Sunil Kumar Mohammed: Will it be possible to make some forecasts with the available data on marine fish landings?

Mini, K.G. With the incorporation of some environmental parameters we can develop forecasting models.

Dr.Srinath: In the DOD funded project on Predictive modeling in Marine Fisheries, we are planning to attempt this. For some pelagic species, we can use sea surface temperature and other environmental variables as inputs. Neural Networks can also be useful in classification using genetic studies and for species identification.

Shri. G.S.Daniel Selvaraj: You have given an application of ANN for phytoplankton production modeling, what are the variables which can be incorporated in the model.

Mrs. Mini, K.G. We can develop a model with sea surface temperature, salinity, pH etc as the input variables.

Dr. Noble: In your opinion, which is better, human brain or ANN?

Mrs. Mini, K.G. Of course the human Brain. Although Man has done a pretty good job in creating his own complexities here on Earth, they're still nowhere near what Nature has done on her own.

The seminar ended by 16.15hrs and Dr. Srinath made the concluding remarks and Shri. G.S.D. Selvaraj thanked **Mrs. Mini, K.G.** for the nice presentation. He also thanked everybody for actively participating in the discussion.

Kochi
07-07-03

(Somy Kuriakose)

SEMINAR BY Dr. SHOJI JOSEPH,

Scientist (Sr. Scale), MFD, CMFRI, Kochi – 14 on 11-07-2003

TOPIC – Clam culture techniques

Date: 11-07-2003 **Time: 15.00 – 16.30** **Venue: Room No. 301**

PRESENTATION

Total Bivalve and Gastropod production in India was 56008 t. in which bivalves formed the major contribution (55343 t) and among bivalves clams contributed the large share (39513 t). There are about 70 species in regional fisheries. Major culturing species in the world include: The hard clam, *Mercenaria mercenaria,*. The soft shell clam *Mya arenaria*; The Atlantic surf clam *Spisula solidissima*; The manila clam *Venerupis japonica*; the ocean quahog, *Artica islandica.*

METHODS OF CLAM CULTURE

Clam cultures include seed Collection and grow out cultures. Seed collection is mainly by two ways; from the nature by sieving the substrates one month after spawning and from the hatchery production of spat. Air lifts down-welling recirculation systems are using in the hatcheries.

NURSERY REARING

Large quantities of spats of (7 – 10 mm) are required for culture so nurseries are pivotal for clam culture. Post-set cultures with small steady flow of pre-filtered seawater & enough food for short period are used for the set larvae followed by post-set rearing systems (static/ raceways). Raceways with slow flow of coarsely filtered seawater with food promote excellent growth & high survival of the seeds. Up-flow and Down-flow culture units; is also used in bigger hatcheries

FIELD NURSERY SYSTEMS

Bottom nurseries used aggregate cover and plastic mesh that provide protection from predators. Tray and rack nursery culture in the shallow sub-tidal areas in single or stacked in tiers, two to several trays high; Suspended nursery culture like- rafts, suspended trays, lantern nets etc.

ONSHORE NURSERY SYSTEMS

The traditional onshore nurseries are raceways or shallow-tiered trays, with continuous supply of seawater. Commercial nurseries use tiers of shallow rectangular trays supplied with substratum (sand /plastic mesh) to hold the clam seed and water overflows through a standpipe or side-drain to common tier drain.

GROW OUT CULTURE

Includes cleaning and leveling of the ground; Preparation of boundary using bamboo poles or Fencing in areas of strong currents and seeding at high tide, synthetic mesh netting for protection. In Land-based pumped raceway system clams are reared in tanks.

Factors affecting survival, growth, productivity and marketability are:
Physical environments: Major culture activities are concentrated in the Inter-tidal zone. Low waves & currents are preferred; Inter tidal exposure will be around 1-2 hr at low tide is ideal as it is easy to remove predators. A shallow bay with firm mud substrates is ideal for clam culture.

Water quality parameters include: Temperature & Salinity; suspended sediments; dissolved oxygen and H_2S; nutrients and red tide.

Biological environment: Competition for food and space. Disease prevalence, predation, and primary production affect the clam culture.

CLAM CULTURE WORKS IN INDIA

Cultivable clam species
Arcid clams, *Anadara granosa*; Venerid clams; *Meretrix meretrix, Meretrix casta, Paphia malabarica* and *Marcia opima*; Corbiculids clams; *Villorita cyprinoids* and Tridacnids; 4 speceis T. *maxima, T. crocea, T. squamosa & Hippopus hippopus* are the major cultivable clam species of India

Hatchery techniques were developed for *A. granosa, P. malabarica, M. meretrix, M. casta* and *M. opima*. Clam culture works in India includes culture of blood clams (*A.* granosa) at Kakinada; culture of *M. meretrix* in Mulki estuary; culture of *M. casta* in Vellar estuary MPEDA financed clam relaying of *Paphia malabarica* in the Ashtamudi lake; transplantation of clams to effluent ponds for biofiltration; culture or relaying /semi-culture demonstrations at Ashtamudi lake and Munambam area (*P. malabarica; M. opima; M. meretrix*) and culture of black clam *Villorita cyprinoides in Vembanadu lake* and culture of *Gelonia* at Karwar margrooves.

DISCUSSION

Dr. Kaladharan-: How safe clam meat for consumption?

Dr. Shoji Joseph-: Clam meat is safe for consumption if it is not collected from polluted areas.

Mr. Daniel Selvaraj-: Is it possible to identify the species of clam seeds while collecting from the wild?

Dr. Shoji Joseph-: The salinity tolerance levels of the clam seeds vary between the species and normally the seeds of the same species are seen in a particular bed. Otherwise it is difficult to identify the seeds.

Dr. Rajagopal-: Why in India Clam culture not taken up?

Dr. Shoji Joseph-: Market is the main problem. Available fishery is there according to the present market demand.

Mr. Velayudhan-: Is there any ban for clam fishery

Dr. Shoji Joseph-: A self imposed ban is practicing at Kollam in Ashtamudi lake for *Paphia malabarica* both for size and season.

Mr. Daniel Selvaraj-: What are the predators of clams?

Dr. Shoji Joseph-: Gastropods, Fishes and Crabs. They crush the live clams and eat.

Dr. Rajagopal-: Fresh water clams are bigger than marine clams Is it true in India? And so why it is not commercially used?

Dr. Shoji Joseph-: Fresh water clams are bigger but its availability is limited and where ever it is available it is also eaten by people.

Dr. Rajagopal-: The clam meats were earlier used as shrimp feeds whether it is used presently and the clam fishery was for shells not for meat. What is the case now?

Dr. Shoji Joseph-: Now also clam meats are given as feeds for shrimp in the culture ponds as it gives more weight for the culturing shrimps. The demands for clam shells are more than the meat. But recently the demand for meat increased for edible purposes and also as feed ingredient for shrimp feeds. The shells of small clams are also used in the shrimp feed industry. Export of clam meat is also started recently and therefore the demand is increasing.

Mr. Daniel Selvaraj-: Whether the clam culture is advisable as it accumulates heavy metals and hydrocarbons many times that present in the surrounding water and sediments?

Dr. Shoji Joseph-: We are selecting sites before going for culture; so definitely the area should be free from pollution of all kinds.

CONCLUSION by Dr. K. K. APPUKUTTAN

Exact estimation of exploited clam stock is difficult due to certain factors like its fishery is mainly from the estuaries and interior areas; beds are distributed widely in different localities etc. The present estimation is only 30% of the actual exploitation. Present estimation is around 50, 000 (t) and it will be more if we do the estimation correctly. If demand for clam meat increases the exploitation level also increase. At Neendakara below the bridge there is only *Paphia* seeds during the spawning season and from that only 10% is surviving contributing to the fishery and rest From Ashtamudi Lake from 60 ha area.10,000 to 15,000 tones of clams can be produced if we do the culture scientifically using the natural seeds set at these area.

The seminar came to a close by 16.30 hrs and Shri. G. S. Daniel Selvaraj thanked Dr. Shoji Joseph for the nice presentation of the topic. He also thanked the Dr. K. K. Appukuttan for the concluding remarks and Shri. Mathew Joseph, reporter for noting down the points and others for attending the seminar and for their interactions.

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